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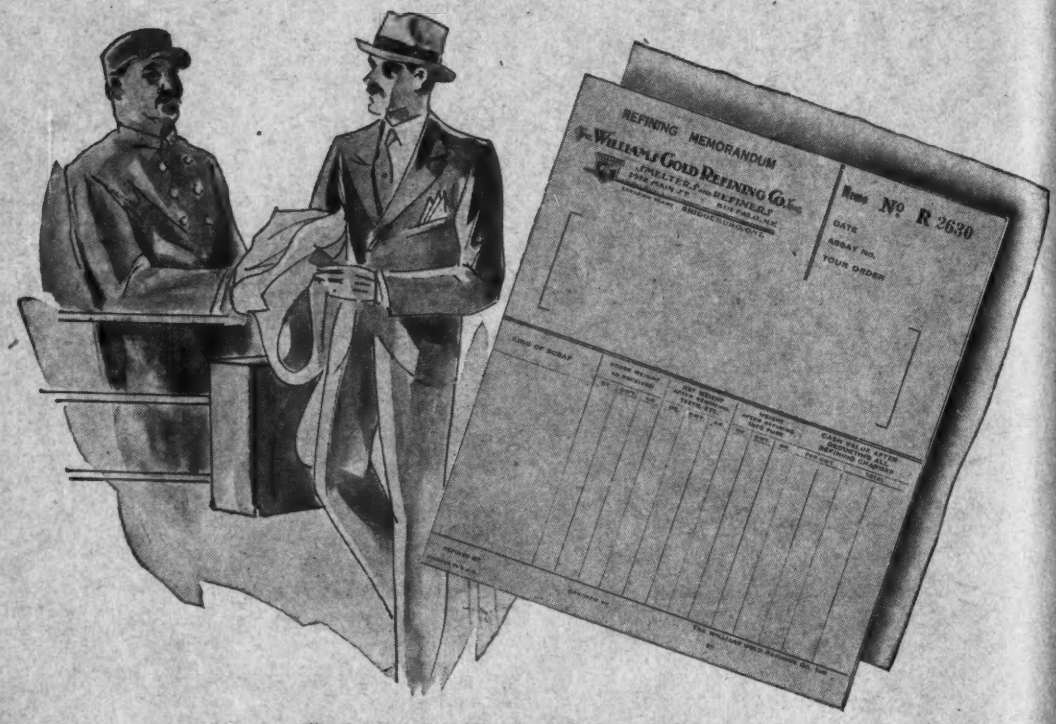

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VOL. XVI ST. LOUIS, JUNE, 1930 No. 6

ORIGINAL ARTICLES

PRESIDENTIAL ADDRESS OF THE EUROPEAN ORTHODONTOLOGICAL SOCIETY

BY DR. A. KADNER, HAMBURG, GERMANY

IT WAS certainly a splendid idea that the American Dental Society of Europe and the European Orthodontological Society should hold their meetings in Brussels at the same time, and I first of all have to thank you for the great honor of being able to welcome you all at the meeting of the latter. It is with pleasure that I recall in this connection the introductory speech of Mr. Northcroft at last year's congress in London. I want to emphasize those leading ideas which our colleague so clearly pointed out regarding the connection of our science with medical science and natural science in general, also referred to at the recent meeting of the American Dental Society of Europe. You all know that the two chief problems with which we dentists have to deal are the problem of caries and that of parodontosis. The former problem cannot be separated from the theories and experiments connected with the assimilation of lime salts. The investigation of the latter leads the stomatologist to intricate studies of the human body as a whole. It is one of the most modern ideas, or perhaps a very old idea which had become forgotten in our era of specialization, that you never should consider a single part of the human body only by itself, but always as being in a most vital connection with the status of internal secretion, and especially with that of the solar plexus.

It is by no means a mere hobby of mine, that I so often lay stress upon the necessity for orthodontists to plunge deeper into the methods and results of the natural and medical sciences. I am quite sure that you all will agree when I say that in this respect the state of things in our profession is not in every way satisfying. But, on the other hand, there has already been done

so much scientific work on our part, especially in stomatology and in the theory of anomalies of developments—I refer to the new research of Dr. Clinton C. Howard published in the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY for February of this year—that it has proved important and useful for medical science as a whole. Dentistry is a science, and so diseases of the dental system can only be treated in full consideration of its biologic destination as belonging to the digestive apparatus, and furthermore to the whole body. In this respect we must be grateful to our American friends who were the first to introduce into our special science the results of the pathology of constitution as gained by famous medical scientists and proved the importance of the dental organ for the whole organism. It is to them that we owe the enlightening notion of focal infection.*

We must be medical people; but we must refrain from too much groping about in far-off branches of knowledge such as philosophical speculation. Did you ever hear that any two philosophers agreed on any tiny problem of theirs? We need not fetch our notions from far away. It is quite sufficient for us to say that an organism that performs its functions just nicely is called normal, and whenever it does not, it is pathologic and wants curing. Now there have always been two somewhat divergent methods of cure. One method, which is sometimes handled with admirable intuition and success, is the merely empirical method, which rejects all theory. The other method tries to base the treatment upon a really scientific knowledge of the human body and is never satisfied until it has gained an adequate idea of the etiology of the case. Our standpoint, of course, ought to be the latter one. Yet it would be very unwise to despise the art of healing in favor of the science of healing. I can very well imagine that one prejudiced scientist can do more harm to his patients in one year than a dozen good old practitioners, not in love with modern notions, will do in all their life.

In the course of the last century the art of healing has, in the hands of men like Morgagny, Virchow, Lister, Pasteur, Röntgen and others, become a real science. And it is our duty now finally to promote our special profession to a status surpassing all mere handicraft and deserving the name of a science.

I called caries and parodontosis the chief problems of dentistry. Well, these two problems are on the way to being solved by modern research. But what about the main problem of orthodontics, the etiology of anomalies? One cannot very well say that this problem has been solved or even is on the way to being solved. It seems to me that the state of things in this respect is rather chaotic, though there is the hope that more and more of us will take an interest in this problem, so that the solution perhaps may not be too far off.

*Dr. Kadner is in error. It originated with Dr. William Hunter, of London, Eng.—(Ed. *Dental Record.*)

FROM THEORY TO PRACTICE: RULES GOVERNING MY CHOICE OF ORTHODONTIC APPLIANCES*

By Dr. J. T. Quintero, Lyons, France
Professor of Orthodontia, École Dentaire de Lyon

I HAD hoped at first to bring you a comparative study of diagnostic measurements of the face and jaws, as taken according to three modern European systems: those of Dreyfus, Schwarz and Simon; I had intended to compare these methods, to point out that each one presents certain advantages, and to show how, by combining these, the best results might be arrived at. However, such a paper would have proved rather tedious to listen to and might not have brought forth as much discussion as one pertaining to appliances and their choice.

I am well aware that in many respects my views may not agree with those held by many of the members present tonight, particularly in regard to diagnosis and nomenclature. I will endeavor, however, to make my meaning clear by using terms acceptable both to my listeners and to myself. On the other hand, I am given to understand that a large number of British orthodontists use removable appliances, particularly vulcanite plates. Personally I prefer the fixed type of appliance, which I can easily make myself at the chairside. I expect, therefore, to find I am more than once at variance with some of the methods practiced on this side of the Channel. Nevertheless I will try to examine with the utmost impartiality the relative merits of various types of appliances for different cases, after having rapidly reviewed the principal requirements which they should meet and the various types of cases to be treated.

In a paper which I read in London, before the European Orthodontological Society, in July, 1927, I pointed out that it was necessary to analyze carefully all the symptoms present in each case by means of a thorough examination of the face, jaws, articulation and teeth, for any possible anomaly. If we look into the detail of these malpositions and malformations, we find that the face, jaws and articulation may be abnormal in the three directions of space, namely, vertical, sagittal and frontal, while each individual tooth may be irregularly placed in the vertical direction, or along the line of the dental arch, or perpendicularly to this line; it may also be rotated.

If we go into greater detail, we find that the parts of the face which we may hope to influence by our treatments may be placed too far forward or backward, too high or too low, or to one side; that each jaw individually may in part or in whole recede or protrude, be too wide or too narrow, or may be vertically under- or overdeveloped; that an abnormal articulation may take

*Transactions of British Society for the Study of Orthodontics.

the shape of an open-bite or of deep overbite, that one arch may be too far forward, compared to the other, or, on the contrary, too far backward, or to one side, or one arch may be partly or totally inside the other; that misplaced teeth may be in lingual or labial, or medial or distal malpositions, may be insufficiently erupted, not reaching the line of occlusion, or, on the contrary, they may have gone beyond that line and be—apparently—elongated, or they may be rotated one way or the other.

It is evident, to those who have even the slightest experience of orthodontic practice, that it is exceedingly rare to find only one kind of abnormality present in any given case, and that we nearly always have to deal with combinations of several malformations or malpositions in the same patient; this fact, I believe, needs no further development.

However, when we wish an appliance to act upon any anomaly or combination of anomalies, we must first make certain that it comes up to the required standard of efficiency, for it is, after all, nothing more than a medium for developing and applying force in a given direction. What standard of efficiency shall we set for our appliances, or, in other words, what should be their essential attributes?

In a report read before the First Annual Congress of Stomatology, in Paris in 1924, Izard gave a very complete and accurate review of all the qualities which should be required of an appliance. These may be classified under several heads: for instance, some relate to mechanics, such as the anchorage, the force used; some apply to physiology, such as the method of action, absence of root resorption, conservation of function of the teeth, absence of discomfort, of hindrance to the movements of the palate and nasal septum, elective action upon the lesions to be treated; others have to do with hygiene, such as incorruptibility of the materials used, ease of cleansing; others are purely esthetic, such as the degree of visibility, and finally the practical points, such as facility of construction and of management must also be taken into account.

Considering these standard qualities from another angle, we can divide them into three principal groups: those which are absolutely necessary and indispensable, those which are important, and lastly those which are only secondary or unimportant. The contents of each group may vary in detail according to each man's views on the subject, but nevertheless I think most of us will agree that among the points to be considered as *indispensable* we may place the following:

(1) Certainty of positive mechanical action. This is dependent upon several factors, of which I will name only:

- (*a*) Perfect and constant stability of the anchorage.
- (*b*) Possibility of symmetric or asymmetric action, both horizontally and vertically.
- (*c*) Absence of reactive forces from the appliance on the anchorage, excluding all possibility of unfavorable displacement of the anchor teeth.

(2) Exclusive action upon the lesions to be cured.

(3) Efficient control of dynamic properties.

(*a*) The force must be simple (spring, screw or inclined plane).

(*b*) It should, in quantity, be just sufficient to initiate the displacement and continue it; it should be easy to measure and to keep under control.

(*c*) The direction in which the force exerts itself should be carefully selected according to the case to be treated.

(*d*) As the point of application of the force to the neck, root or apex of the tooth varies according to the movement to be obtained, it should not be the crown of the tooth near the incisal edge or masticating surface, excepting a few particular cases.

(*e*) Its action should be continuous rather than intermittent.

(*f*) Its transmission should be obtained through direct pressure rather than through interposed substances, such as rubber rings or strips, wood, ligatures, etc.

(4) Absence of all likelihood of root resorption.

(5) Absence of hindrance to flattening of the palate and straightening out of the nasal septum.

(6) Action through physiologic stimulation of tissues, but without the slightest irritation.

(7) Conservation of all the conditions which allow the teeth to continue their physiologic life: individual movement during mastication, physiologic migration of the posterior teeth toward the front of the arch, preservation of normal articular relations, and of the physiologic axes of the teeth.

Among the *important,* though not indispensable requirements, I should place the following:

(1) The form, size or location of the appliance must not cause discomfort or interfere with free muscular play of the lips, tongue or cheeks, and the mastication and speech must be unhindered.

(2) The appliance should be unaffected in the mouth by the attacks of any chemical or bacteriologic agents; this precludes the use of substances which might ferment or cause fermentation, such as wood, thread, silk, soft rubber when used as permanent fixtures, or which might undergo chemical changes, such as iron, steel, bronze or German silver, or which finally lose their usefulness, such as soft rubber after a short time.

Last, among the *secondary* qualities, we may place:

(1) Invisibility of the appliance.

(2) Facility of cleansing.

(3) Ease of construction.

(4) Simplicity of management.

With these different points in mind, and in order to determine in what specific cases each one may best be used, let us now examine the various appliances.

For convenience we may divide them into three principal groups: immovable, fixed and removable. By *immovable* appliances I mean those which

must not be removed, either by the patient or the dentist until the treatment is finished; such is the Lourie soldered lingual arch, or the appliance for separating the maxillae at the median suture. By *fixed* appliances, we may understand the usual labial and lingual arches which may be taken out by the dentist but not by the patient; such are the various types of Angle arches, the Mershon lingual arch, the Ainsworth arch and other appliances developed from these. By *removable* appliances, we understand those which may be taken out by the patient, as well as by the dentist; such are the Jackson type of appliances, vulcanite plates, etc.

Looking at them from a different angle, we find that some appliances are placed on the lingual (or palatal) side of the dental arch, others on the labial. If we except those which exert a very strongly positive action, such as the pin-and-tube appliance or the ribbon-arch, all other appliances work best when used to transmit a pushing force.

For instance, if we take lingual appliances, we find that expansion plates or lingual arches of various descriptions, or Jackson cribs, including the Crozat modifications, work best when used for pushing the teeth outward, that is, for unilateral or bilateral expansion of the dental arches, or for forward movement of the teeth or arch.

On the other hand, labial appliances do their best work when contracting the dental arch and pushing the teeth backward, or sometimes in vertical movements, such as are accomplished either by the Angle ribbon-arch or by the Case alignment arch.

Of course, the ribbon-arch, the pin-and-tube, and other similar appliances of very positive action, e.g., the Robinson arch, or, oldest of all, the Case alignment arch, may be used to develop force in any desired direction, but these are exceptional appliances and in my mind they should only be applied in a limited number of cases because it too often happens that their action is accompanied by root resorption, as was demonstrated on a certain number of cases by Albert H. Ketcham at the Seventh International Dental Congress, in Philadelphia in 1926.

If we then leave these aside, as applying only to exceptional cases, we find in ordinary practice that our choice approximately will be limited to the following:

(*a*) Labial appliances: labial arches of the old Angle type.

(*b*) Labiolingual appliances of the Ainsworth type.

(*c*) Lingual appliances: (1) vulcanite plates, expanded by screws, springs, or other devices; (2) removable appliances of the Jackson or Crozat type; (3) lingual arches of the Mershon type.

It is, I think, unnecessary to give a description of any of these appliances, as I am certain each one of you is perfectly familiar with all of them.

In nearly all of our cases it will be found that one or both dental arches will need expansion. For such treatments the old Angle arch is *not* to be advocated. It is not well suited for such work, as it tends to tip the teeth, and its action is always indirect, since it is obtained through ligatures, while most other types of appliances have a direct and therefore a much better action.

However, it so happens that in very many cases expansion of one of the dental arches must be accompanied either by some individual tooth movement or by displacement of the other dental arch, for instance by means of intermaxillary rubber ligatures. Whenever a tooth is to be rotated, it will be found that a labial arch wire is the most efficient type of appliance, as well as the easiest to handle. Where a tooth is to be displaced horizontally, either labial or lingual appliances may be used, and the movement is then produced by means of auxiliary springs; which type of arch is used for that purpose is immaterial, so long as the auxiliary spring acts directly upon the tooth. Where important vertical movements are to be produced, the most efficient appliance, and the easiest to construct, is Case's alignment arch, or some apparatus using the same principle. Whenever displacement of a dental arch is to be effected by means of intermaxillary rubber ligatures, it will be found that the anterior anchorage may best be placed upon a labial arch, while the posterior anchorage may be attached equally well to a labial arch, or, if a lingual arch be used, to the anchor bands.

In short, my practice has taught me that each type is best suited for the treatment of certain classes of cases. I do not believe that anybody can use *one* type of appliance to the exclusion of all others, and meet with constant success.

A few examples taken from my practice will serve to illustrate my meaning far better than long descriptions. For instance, Figs. 1 and 2 show cases with deep overbite, in both of which the dental arches were very narrow.

In the first case (Fig. 1), a labial arch was used for the maxilla on account of the rotated teeth, and a Case alignment arch for the mandible to obtain vertical movement.

In the second case (Fig. 2) the mandibular first molars had been extracted several years previously, owing to deep and extensive caries, while the mandibular bicuspids were of a most extraordinary and irregular shape. Two labial arches were used for the following reasons: a lingual arch could not be placed in the maxilla, because the mandibular teeth struck the palate behind the central incisors; while on the mandibular arch a Case alignment wire would have been used, but for the fact that the maxillary incisors were much too near the mandibulars and actually made it impossible to use anything but an ordinary labial arch passing very low near the gum line. Another reason for using this was to allow for the anterior migration of the second molars to close up the space left vacant by extraction of the first molars.

In Fig. 3 we see a case of open-bite in which Case alignment wires were used on both dental arches, because of pronounced maldevelopment of the maxillae; on the contrary, in the following case (Fig. 4), which was somewhat similar in appearance, the open-bite was much less marked, and was due mostly to faulty articulation in the frontal direction; here it was found advisable to use lingual arches of the Mershon type, both for the maxilla and mandible, and with gratifying results. In still a third case, the open-bite was much slighter, and the outstanding feature was the anterior tipping of the

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Fig.1
Fig.2
Fig.3
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Fig.6
702
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668
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Fig.9
Fig.10

maxillary incisors; here labial arches of the Ainsworth type were used, the upper one, however, being coupled with a secondary arch or auxiliary spring; the anchor bands, of course, carried, soldered to them, heavy drag wires extending, on the lingual side, from the second molars to the canines (Figs. 5 and 6).

In a case of impacted canine, in a young woman of nineteen, an auxiliary spring attached to a Mershon lingual arch was used to draw the tooth down, and Fig. 7 shows this case during the process.

It is not always necessary or advisable to use a complete labial or lingual arch wire. For instance, in the case of a young girl of fourteen, where a maxillary central incisor was only partially erupted owing to faulty articular relations, a partial arch was used, anchored to the canines, and acting on the unerupted tooth by means of an auxiliary spring (Fig. 8). Likewise in closing a diastema between any two teeth, an M-shaped spring, attached to bands, often suffices. Fig. 9 shows the method for closing a space between a mandibular canine and bicuspid with a Rodgers spring, while Fig. 10 illustrates the closing of a space between two central incisors, using my personal modification of this valuable appliance.

I hope that I have made it clear that the proper choice of appliance for each case is necessary if success is to crown our efforts. This choice is subject to certain preliminary considerations:

(1) A complete analysis of the abnormalities of the face, jaws, articulation and teeth.

(2) A correct diagnosis of conditions.

(3) An accurate estimate of the movements to be brought about, both through orthodontic mechanism and through nature's own processes.

(4) A clear conception of the simplest appliance possible, which will fully answer the desired purpose.

Following this, correct construction and proper management will ensure the best results.

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DISCUSSION

Mr. Carl Schelling said the author had spoken of spreading the arch and bringing down the palate. Personally, he must say that he had never heard before, in all his experience, of anybody who had had the necessity forced upon him of bringing down the palate, and he wondered what happened with regard to the septum nasi. He did not know whether Dr. Quintero did the operation in collaboration with a nasal specialist, who bent or excised part of the septum, and he would be glad if Dr. Quintero would enlarge on that point.

With regard to buried canines, he remembered that many years ago he had had a patient about 35 years of age—an actor—who had lately lost his deciduous canine on one side; all that could be seen was the tip of the crown of the permanent canine level with the gum, but so crowded laterally that it could not possibly erupt. He had rather pleased that patient by just grinding off the point, finally extracting the pulp, enlarging the canal, and putting a very nice-looking porcelain crown upon the top of the canine tooth, meeting the mandibular teeth edge to edge.

Dr. Quintero, in reply to Mr. Schelling's point about the nasal septum and the palate, threw a slide onto the screen, which, he said, in the opinion of Baurmann, showed what probably happened in cases of rickets. The full line represented the normal condition. In cases of rickets, an action of the masticating muscles was exerted upon *that* point and *that* point, which brought in the jaw and threw up the palate. The nasal septum could not remain straight. It became bent. The patient came with that condition. If the arch was spread—if one had an appliance which prevented the displacement of the palate, preventing it from moving down vertically, then one prevented the straightening of the nasal septum. If, however, the appliance left the palate free, then it could come down, and the nasal septum would straighten out if the palate were sufficiently widened. Concerning impacted canines, that was one of the worst problems which practitioners had to face. He remembered one case with which he had to deal in which the point extended over and beyond both centrals. It was the right canine, and the tip of it was on the left side of the jaw. It had taken him something like 2½ to 3 years to bring the tooth back into position, but he had finally got it there, with a lot of patience on both sides. One thing which he considered very important was the diagnosis of impacted canines. Quite often patients were seen with rotated incisors. Personally, he found very often that such a condition would put him on the road to diagnosing the presence of an impacted canine, and he had finally made it a rule, when he saw a case of rotated incisors, and whether the deciduous canine was present or absent (but in any case when he did not see the permanent canine), to have an x-ray taken; and very often he found that the canine was impacted, and from the direction in which the teeth were rotated he could very often infer, almost always correctly, whether the tooth was impacted on the palatine or on the labial side. He found that usually when they were impacted on the labial side, the distal corner of the incisor was moved outward and the medial corner was, of course, moved inward; whereas if they were impacted on the palatine side the opposite held true—not always, but mostly. When one wanted to bring down an impacted canine, it was sometimes difficult to get at it and get a hold on it. In the case he had shown during the course of the reading of his paper, his assistant and himself had worked unsuccessfully for over an hour on the palatine side trying to find the canine. He had gone halfway up the distance of the root of the lateral, and had not reached it, and he had given up all hope of ever finding the tooth, and had come to the conclusion that he would have to wait for it to come down. More x-rays were taken and he decided that probably it was on the labial side. At that time however the lateral was not tipped out, as it was in the picture he had shown. He had then let the patient go for the summer, and about two or three months later, when she came back, he had been lucky enough to find the tooth high up on the labial side, and it lay still higher than he had opened up to on the previous operation. He had managed to drill a hole and cement a pin in the tooth, but unluckily it was a difficult operation to perform because the tooth was so high up in the fold of the lip that he had had difficulty in keeping it dry. It had taken him an hour to get the tooth uncovered, the hole drilled and the pin cemented into position.

Mr. A. T. Pitts said that Dr. Quintero had given a most admirable paper—one that was not easy to comment upon at a moment's notice. The first part of the paper was extraordinarily valuable, and when it appeared in print he proposed to go through it again in order to see how far his own practice corresponded with the criteria mentioned, which struck him as being extremely sound. With regard to the point which had been raised by Mr. Schelling, Dr. Quintero had quoted the explanation of Baurmann, but personally he was not at all sure whether, in the present day, it held good that the condition of a narrow arch with a high palate was due to the failure of the palate to descend. Cryer, many years ago,

had shown by means of sections that one might get a high palate with a perfectly straight septum, while one might also get a broad and relatively low palate with a deflected septum. Brash had put forward an explanation with regard to the high palate, suggesting that the alveolar process instead of growing downward and outward had grown downward, and that a high palate was not necessarily a sign of failure of development of the nasal septum. Dr. Quintero very rightly said that practitioners ought to use whatever appliances they found best, and that it was a mistake always to think in terms only of fixed appliances or of removable appliances. Dr. Quintero had also said, quite truly, that in this country the Anglo-Saxon tendency was to use removable appliances. Personally, he thought a very good case could be made out for the use of removable appliances in many instances. The use of an appliance ought to be conditioned entirely by etiologic and pathologic factors. One of the tendencies of orthodontics was that the mechanical devices (of which, like the making of books, there seemed to be no end) were so very much in advance of one's knowledge of etiology and pathology. The fact undoubtedly remained that a good deal of orthodontic treatment, however successful it might be, was none the less hopelessly empirical. There were certain points with regard to appliances at which, it seemed to him, those who used fixed appliances found themselves handicapped. For instance, taking the question of raising the bite, Dr. Quintero advocated the use of Case's appliance, in which the wire was so arranged that it raised the cheek teeth and depressed the incisors. There was a good deal of evidence to suggest that in cases of close-bite, there was an actual failure in vertical development and an imperfect degree of eruption of the molar teeth. By means of a removable appliance thickened in front, on which the lower incisor teeth bit, so that there was a gap of about 2 mm. in the molar region when the teeth were closed, room was made for the molar teeth to erupt to a further degree, and thus the over-bite was corrected. He would like to know if there was any evidence to suggest that in those cases in which the mandibular incisors bit on the palate there was an overdegree of eruption of the incisor teeth, and whether there was any reason to think that it was actually possible to depress the mandibular incisor teeth in their sockets, thus relieving the over-bite in that way. Personally, he had always felt very sceptical as to whether it was possible to do that. Yet the Case appliance, according to Dr. Quintero, did seem to act; it would be interesting to know why it succeeded. In conclusion, he desired to say what great pleasure Dr. Quintero's paper had given to him.

Dr. Quintero said he was afraid he was not able to satisfy Mr. Pitts as to the reason why vertical development might or might not take place. All he could say was that when the treatment was finished the teeth were apparently on the proper level. What had taken place he was not prepared to say, and he did not think that anybody exactly knew whether there had been bone resorption under the anterior teeth or bone formation under the posterior teeth; but he had treated two or three cases in that manner, and he had apparently good results. He said "apparently" because he was not quite sure. He did not pretend to succeed in every case he undertook. He only thought he had a good result, because it had not moved yet; it had not moved simply because he had still left the appliance on, and he was rather afraid to take it off, as he did not know what would happen. He quite understood Mr. Pitts's point of view, and he thought Mr. Pitts understood his point. The whole thing was done rather empirically for the best, and he thought that was all that could be done.

Mr. J. H. Badcock mentioned one small modification which he used. Instead of banding the mandibular incisor teeth and putting hooks on them, he brought little hooks attached to the arch over the edges of the mandibular incisors. That saved the trouble of banding (which he always disliked) and it had the same effect.

Mr. Gray desired to add his thanks to those of previous speakers for Dr. Quintero's paper. Mr. Gray would like to venture a criticism. Dr. Quintero had suggested too many appliances for private practice. In his own opinion the simpler and fewer appliances used the better; it was simpler to gain complete skill in one main type of appliance. He had found that instead of banding a number of teeth and using a great many auxiliary springs, he could get a great deal of movement by tension in the lingual arch itself. He had treated very similar cases to those which Dr. Quintero had shown on the screen by straightening out

the convolutions of the arch itself; and then it had not been necessary to hook down the arch with banded premolars, or complications like that. With regard to unerupted canines, if one had stereoscopic radiographs made, it helped one to locate whether the tooth was labially or lingually placed, and if one could use the electrocautery in cutting down to the tooth, one did not get anything like so much bleeding. Then if the wound was packed with gutta-percha for another sitting, it was possible to obtain a perfectly visible and dry tooth for insertion of the post.

Mr. W. A. Bulleid thought a most valuable appliance was the bite-plate, on which he had been working for a number of years. In a very large number of cases which practitioners had to treat (for instance, those which Dr. Quintero had shown) there was very marked overbite. He had no scientific evidence to support his statement, but he did think that the main cause of failure of development was a lack of alveolar development in the posterior regions; and he had adopted the apparatus which Mr. Pitts had mentioned—a simple bite-plate thickened in front. He was slowly accumulating quite a larger series of cases illustrating the efficacy of such an appliance. For instance, many cases of Angle's Class II seemed to react in the most extraordinary manner to a mere insertion of the bite-plate, keeping the incisor teeth away from the gum in front. Not only was there occlusion in the posterior teeth very soon, but also the lower jaw seemed to drift forward to what was more or less its normal position; and as far as he could see that action did not seem to be limited by the age of the patient. Not only did the posterior teeth rise, but also he was inclined to believe, with Mr. Pitts, that the anterior incisors were depressed; and after putting in the bite-plate and gradually raising from time to time one got as much as three-sixteenths of an inch increase in the vertical height between the gingival margins of the posterior teeth. Not only so, but it seemed to allow of a freer action of the muscles of the lip and of the tongue, and there seemed to be a considerable straightening up of the irregular teeth all round the mouth. Perhaps one day he would be able to speak more authoritatively on the subject; at present he had only data to show that, starting off treatment with the bite-plate, materially simplified subsequent treatment.

Dr. Quintero said he did not mean to imply that he never used bite-plates, because he did. His intention had been only to show that one must be eclectic in one's choice of appliances, and also to indicate that good results could be obtained from almost any appliance, provided it was used under the proper conditions. He used bite-plates occasionally, and he considered them one of the best means of obtaining vertical movement of the teeth. He thought all too little attention had been paid to the question of vertical development. It was rarely seen referred to in textbooks, and if it was referred to, it was not dealt with extensively. It was a matter which needed a great deal of thought. It was one of the most difficult things to treat. The proof of that was that Mr. Badcock had just mentioned one way of obtaining vertical development, which was a very good way with which he was not personally acquainted, and other methods had been mentioned by other members; he himself had mentioned Case's method. The great number of methods in vogue simply proved that no method gave very positive and certain results. Usually when one found a great many methods of treatment for any disease or abnormality, it simply went to show that no one method was perfect. Bite-plates were a very good method of treatment provided they were applied in cases in which they could be properly used.

Mr. Cale Matthews thanked Dr. Quintero for his paper. It was obvious that anyone with any experience of orthodontic practice must long ago have come to the conclusion that one type of appliance was an impossibility for general success. Dr. Quintero was quite conversant with the fact that the English practitioner was still very seriously attached to his removable appliance; and under certain circumstances it was well that he should be. For one reason orthodontic practice in this country was wedded to general practice so firmly that the time necessary for any accident that might happen to a fixed appliance to be remedied at the moment was not always available. Hence, the difficulty to repair might delay the treatment and cause a certain amount of disaster. A practitioner must use the type of appliance which, in his hands, gives him the greatest success, and which is also the easiest to manipulate. He had been interested in the remarks of Dr. Quintero, and in the

criticism of Mr. Pitts, with regard to the vault of the palate. It had been his own custom always on the removal of an impression to first glance at the contour of the palate. It would be found, he thought, that a very small percentage of impressions would show an equal or symmetric palate. It was depressed on one side as a rule. Whether that gave any clue to the diagnosis was a matter which the practitioner must decide for himself when he came to study the case further. With regard to depression or elevation of teeth, he thought that something undoubtedly did happen; but he thought it was Mr. Dolamore many years ago, and Mr. Norman Bennett later, who demonstrated the fact that one might have a more or less fully erupted permanent denture and what was also described as an excessive overbite; that one might endeavor to remedy that overbite by such a means as a bite-plate, and allow the posterior teeth to overerupt, and get them into a more or less pathologic condition in the molar region. Whether anything happened in the anterior region of the mouth to depress the incisors it was difficult to say, because radiographs did not show any change in the bone or teeth. If those teeth, on the removal of the appliance, in the rear of the mouth would maintain the forces of mastication, the case might be considered a success. He thought those cases had been demonstrated by models. It could be clearly proved that elevation occurred when an opposing tooth was removed, whereas depression was one of the most difficult things to undertake. He thought cases of success of that type were largely to do with the age of the patient. If the patient was a child of 7 or 8 years, with an excessive overbite, with the apices of the incisors open, it was possible to get a more marked and permanent success than with a child of 12 or 14. Those things were apt to be overlooked when descriptions were given of those patients.

Miss Smyth asked Dr. Quintero's opinion as to the possibility of taking measurements in order to discover just what changes had taken place in vertical development. She herself maintained that it was possible.

Mr. Northcroft pointed out to Dr. Quintero, for his information, that Miss Smyth was an expert measurer of jaws and skulls, and proposed to adapt her method of measurement to this orthodontic process for the purpose of demonstrable proof as to whether the incisors could be depressed or not. Miss Smyth made measurements which were within the accuracy of 1 to 2 millimeters every time, so that he did not think there was any question about the possibility of being able to prove whether a tooth had been depressed 2 millimeters or not. Those who claimed that they could depress incisors might get Miss Smyth to measure the cases.

Mr. H. C. Visick remarked that some people seemed doubtful as to whether incisors could be depressed. He remembered Dr. Angle twenty years ago teaching in his school that it was impossible, but he himself was absolutely certain that it was possible. He had done it many times—sometimes inadvertently. If one used a bite-plate, as he himself did, with little spurs which rested on the incisal edges of the maxillary incisors, and if one spur was put on each central, and if the weight of the bite was allowed to be taken by those spurs, the maxillary incisors would be found going up into the jaw very soon. He never put on spurs on less than four teeth, because if they were put on two teeth only, those two would be driven up into the jaw. He had once had a boy with one central badly chipped. He had let the wires rest on the other three incisors and had pushed them all up into the head, and had left that one incisor. He had then ground it off so that the chip did not show. It had been as simple as A B C to do it. He was quite sure they could be depressed. In the old days when one used Angle appliances with the ligatures on the four mandibular incisors, if the boy went away for a holiday and three incisors lost their ligatures, when the boy came back one found the remaining incisor lower than the other three. He always assumed that one was pushed down in its socket and not that the other three had risen up. In cases of excessive overbite, his impression was that the incisors were not really too long. His impression was that the back teeth having failed to erupt far enough, the incisors had passed each other too far, but that in relation to their own jaw they were not really overerupted. In these cases if one looked at the face as a whole, the distance from the nose to the bottom of the chin was really too small, and the jaws needed separating.

The President pointed out that Mr. Cale Matthews' description of the induced eruption of the back molars as pathologic would not coincide with Mr. Visick's view of the case.

Mr. Visick said he had noticed that. He had wondered whether Mr. Cale Matthews had really meant it or not. Did Mr. Cale Matthews mean pathologic condition or position? Could there be such a thing as the latter?

Mr. Cale Matthews said he had meant condition of the bone under pressure or relief of pressure. The bone had to be regenerated.

The President said his own impression with regard to inducing the molar teeth—the first or second molars—to overerupt was that if they were assisted to accomplish that movement at a time when the process of eruption was taking place, the height would not be lost. It had been Mr. Dolamore who had put a case before the Society some years ago. He himself had seen a girl aged 11½ years; the case was one of marked distoclusion with contracted arches; so much so that when there had been an unfortunate domestic occurrence in which there had been a difference of opinion, an appeal to the courts was necessitated, the child had been cited in the ensuing dispute as having been so malformed that mere persuasion to eat at meals was of no avail. It was maintained that the ill-treatment complained of had been justifiable in order to make her eat food at all. Later the child had been brought to him, and as treatment, the first molars and the premolars had been capped about the time when the second molars were preparing to erupt, the arches were spread, and the maxillary incisors retracted. The second molars duly erupted, and to an obviously greater length than they would have done; that was some years ago. Retention had been maintained for three years with no relapse, and a most satisfactory and normal occlusal plane had been built up. The present case of ease of retention was undoubtedly due to assisting the eruption of the back molars; and the requisite height had been obtained to keep the mandible in a forward position.

Mr. Chapman said he thought that two sentences in particular in the paper were of the greatest importance. One was at the end, in which Dr. Quintero emphasized the necessity of deciding what to do, and the other was at the beginning, in which Dr. Quintero emphasized the necessity of choosing an appliance which would do the work which it was decided needed to be done. That was the crux of the whole problem. He had been particularly struck with Dr. Quintero's cases of excessive overbite, and had intended to ask many of the questions which had already been put; but he would like to inquire how Dr. Quintero brought forward the mandibular incisors in the case in which a buccal arch, placed below the gingival margin of the teeth, had been used. It would be interesting if Dr. Quintero would explain the method employed. In some cases of excessive overbite it seemed to him extremely difficult to use a bite-plate. The overbite was so great that the plate became almost unwieldy. On the other hand it was difficult to use a lingual arch because of the mandibular incisors biting into the soft tissues. He himself had got over that difficulty by placing the lingual arch a little further back than the incisors so that it was missed by the mandibular teeth, and adding to the arch a spur which just caught the centrals but yet was missed by the mandibular teeth. It was possible sometimes to arrange it so, and he had been quite pleased in two cases with the way in which it had worked. He was not quite sure whether it was germane to the question, but he could not imagine excessive overbite was due to lack of development of alveolar process or lack of eruption of teeth or even to shortness of the teeth. It seemed to him that these overbite cases were the result of lack of development of the basilar portion of the bone in the molar region. With regard to x-rays to determine whether a canine was buccal or lingual to the arch, one could tell for a certainty if one had two or more x-rays of the same tooth and its neighbors taken at a different angle. It was difficult to explain how to do it without a diagram, but it was set out fully in Bennett's "Dental Surgery." He thanked Dr. Quintero for having given such a stimulating paper.

Dr. Quintero thanked Mr. Chapman for his remarks. With regard to the development of the alveolar portion of the bone, Mr. Visick had said that he thought the development was normal in the anterior portion. Personally he was quite of that opinion. The fact that proved it, to his mind, was that the lower portion of the face was too short compared with the upper—that the height was really diminished, and this proved that the posterior portion

was underdeveloped. That would not be contrary to what Mr. Chapman had said, but it would seem that there was a lack of development on a level with the premolars. Usually, if one looked carefully at such a lower model, it seemed as if the jaw had been made to bend at an obtuse angle just on a line with the premolars. He did not know whether there was any lack of development in the basilar portion, but he thought it was possible that there was a lack of development in the anteroposterior direction sometimes in such cases, because it looked as if the premolars, when erupting, were wedged down by the molar at one side and by the canine at the other.

The President said he thought the discussion had now drawn to an end—not because there was nothing more to be said, but because the questions raised were such that more could not be said without years of further study. On behalf of the Society he extended to Dr. Quintero sincere thanks for his paper and for having come such a distance in order to read it before the members.

SOME PRACTICAL SUGGESTIONS ON PRACTICAL ORTHODONTIA*

By Dr. Herbert L. Wheeler, New York, N. Y.

THE question of correcting irregularities of the human teeth and malformation of the bones of the jaw is an important one, quite as important as the problem of mouth hygiene and sanitation of the oral cavity.

How to do this so as to obtain the normal growth of the maxillae and mandible is the chief problem with which we are confronted. In order to approach this question with a reasonable amount of intelligence and to proceed with a fair prospect of satisfactory results, one must have a good knowledge of fundamentals.

It is desirable to know or have a reasonable working theory of the cause of the cellular deficiencies that produce malformations, also the causes that produce enlargements or deficiencies in certain portions of the maxilla and the mandible, including any abnormalities in the ramus of the mandible or the glenoid fossa. It is inconceivable that one can have this knowledge without the proper information concerning the histology of both the hard and soft tissues of the mouth and jaws and a good working knowledge of the anatomy of the muscular tissues of the mouth, including the muscles of mastication. Also an equally good knowledge of the anatomy of the teeth, which implies much, with a complete knowledge of the supporting hard tissues and their covering mucous membrane. Added to this one must know the arteries that carry the blood to these parts, and the nerve supply.

If our orthodontist is sure of himself upon these points and knows his pathology so well that he appreciates all that is involved in a deviation from the normal of any kind, he is reasonably equipped to carry on the attempt to restore the jaws and teeth to their natural positions and the teeth to their normal relations. To fill these requirements is, however, but working in a primary grade. It does not by any means meet the demands that the public has a right to require from the members of our profession who hold themselves out to be specialists and experts along these lines.

If the orthodontist is to fill a reasonable mission, he must eventually prevent these unsightly malformations which mar, retard, and ofttimes seriously injure the physical and social welfare of the individual. At this particular point certain other considerations should be mentioned because of their correlation to the physical welfare of the patient. I mean the question of the most desirable means of obtaining results, in the matter of mechanical appliances, for the application of the necessary force to produce movement of the teeth and the requisite change in the surrounding and supporting bones.

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In this work it is easy to set up acute inflammations that may go much further than stimulating the proper growth and cell change that produce just the right activity of odontoblasts and odontoclasts. But a short step and the destructive forces are in the ascendancy, and the work of the specialist becomes a menace to the individual instead of a boon. Pulps are destroyed and become points of infection. The alveolar process is destroyed and never replaces itself. Nervous disorders are started which may never be repaired, and even tissue growths are created which may become serious or malignant tumors. My thesis will, therefore, deal with the means employed to obtain improvement as well as a discussion of the malady.

Although the defects and location of various teeth in malocclusion have been systematized, by being classified by some dentists who practice orthodontia, into various numbered types, it is doubtful if these classifications are of much value save to permit abbreviation in writing and teaching.

The question, which is an important one, as to whether the vital forces of the patient will respond rapidly, slowly or not at all to our efforts, is impossible of a classification that can be abbreviated by numbers of types. Each case calls for individual judgment and puts to the test the operator's knowledge as well as his mechanical skill.

While technic is essential and necessary in all cases, a knowledge of the conditions with which we are dealing is more essential. Will the bone ills respond to our action and produce growth and development? How long will it require to obtain stability and permanent location of a tooth or teeth? Must we keep the teeth that have been placed in new positions in the grip of a retaining appliance for a short or a long period of time? Does our knowledge of the patient's physical characteristics enable us to decide this problem with some degree of accuracy?

If the retention period is too short, will the teeth return to their original malformed position; if too long, will the prevention of growth and development by the rigid retaining appliance induce other troubles? Will teeth with cusps properly interlocked in normal occlusion stay in place without the necessity of placing a retaining appliance?

These are questions that require a knowledge based upon not only a thorough grasp of the fundamental principles of anatomy and histology with which we are dealing, but also an added knowledge based upon some years of personal experience in treating and dealing with these cases. It would not seem that the young man just graduated from college, with no experience as a general practitioner, could fully meet these requirements, certainly not with but a short six weeks' course in an alleged postgraduate school.

Here we might look ourselves in the face and ask ourselves the question: Do all of those who practice orthodontia choose the specialty because of special fitness and adaptability or because of the lure of generous fees? Is it not fair to require of all entering this specialty of dentistry, a sufficient skill, knowledge and judgment, not only to obtain reasonable results in the fullest sense of the word, but also to insure to the patient that there will be no destruction of living pulps or bony structure, that there will be no irritation

of the soft tissues, or laceration that may lead to tumors of the mucous membrane, or caries or necrosis of the bone. Recently I have seen an anterior tooth brought into place where a posterior tooth belonged and the posterior one in the place of the anterior one. Was this because of ignorance of the proper anatomic location of teeth or because of inefficient technical ability?

It would seem that when attempting such an important action as practically remodelling a child's face, the good name and reputation of the profession as well as the interest of the patient requires better knowledge, skill and judgment. Is the training obtainable in orthodontia at the present time a showing of how to make and apply given patterns of appliances, how to apply certain appliances obtainable ready-made, or are we taught the principles of the application of force under the various conditions that may present themselves? In the case of the latter are we given instruction that will enable us to create the necessary appliance for each particular case? If so, are we accustomed to make an original appliance for each individual that will as nearly as possible meet the peculiar requirements of each case?

The thought I am trying to bring home to you is this: in the practice of orthodontia are we endeavoring to work out an original plan to meet the requirements of each individual?

It would seem to me that to be able to discern the variations that occur and develop in any given number of cases, one must of a necessity know the normal. To do this the thorough knowledge of both the anatomy and histology of the mouth and teeth is the first requisite.

Having this, a further knowledge is quite necessary—that of the departures from the normal that occur. How shall we know this? If we are qualified to know the normal by our thorough knowledge of fundamentals, our work is of course more easy and the result more accurate. The reading of the printed page or the gazing upon photographic reproductions will not completely inform us. Not only is it necessary to discern the normal from the abnormal, but more is required: we must at times compare one variation from the normal with other variations. To do this requires some years of observation of cases. How shall this observation of actual cases be obtained? There are several methods that suggest themselves. One may have a general practice for a number of years. This is obviously the superior means of acquiring knowledge, provided the fundamental information concerning anatomy, histology and pathology have been mastered.

There are also provided in some localities internships in general hospitals. One may avail oneself of this privilege and obtain a vast amount of practical experience and knowledge in a short time. After this experience or that obtained in private practice for some years, one is then in a position to get some help from a postgraduate school.

It is obvious that most postgraduate schools in dental subjects are of little value to the newly graduated dentist. His knowledge, which has mostly been taken on trust, is scarcely of a kind that will enable him intelligently to coordinate the various factors and arrange them in an orderly manner.

To do this the student must have had experience extended over a sufficient time to learn that much that has been taught him is only relative. An extended experience is quite likely to convince him that nature, in developing abnormalities, does not form them into classifications for the benefit of the teacher and practitioner; that these classifications and alleged systems have been developed, not because they actually describe the abnormal and pathologic with accuracy, but rather to assist the teacher with a minimum knowledge of his subject, to teach; also to permit the technician to produce appliances, like ready-made clothes, which will meet the requiremens of the imperfectly informed who have depended upon short-term postgraduate schools for the sum total of their orthodontic information.

The really good dentist is the man who, from knowledge and experience, is able to discern the real difficulty; then, if necessary, apply the remedy without being confined to the limited and conventional materials that may be purchased down the street. The same may be said of an efficient orthodontist, like the man who endeavors to replace the loss of all the maxillary and mandibular teeth; he must have in his mind the ideal occlusion of the teeth and how to obtain this condition.

In orthodontic practice one must go farther than this; it is necessary to consider a good masticating surface and, as far as possible, a perfect occlusion.

There are, however, other considerations even more important than this: the question of facial appearance and expression projects itself into the problem. This is especially important in the female.

The question of appearance involves histology, mechanics and the general characteristics of the patient, her grade of vitality and ability to develop to the limit. The query may possibly arise: shall a tooth or teeth be extracted to improve the condition? The question of mechanics may play an important part here, as: shall teeth be moved bodily by use of the perpendicular tube, or have the crowns merely tipped in one direction or the other by use of the horizontal tube?

It has been stated to me more than once that many of the terms used in dental articles were unnecessarily complicated, often of uncertain meaning, and ambiguous—and on the whole about as far from simplicity of diction as it is possible to be. It seems to me that dental nomenclature is in a somewhat chaotic and demoralized state. After all, we use language to express thoughts, and the more clear, simple and direct the terms used, the better the expression and the more easily understood. For this reason, in this article I have tried to use simple language, and have purposely avoided intricate technical terms.

In the movement of teeth, my experience leads me to the conclusion that the growth of the bone is better facilitated if practically all the malposed teeth are subject to pressure at one time. There are of course exceptions to this rule. As to the type of pressure or force used, this must be a matter of judgment on the part of the dentist. There would seem to be a reason at various times during an orthodontic procedure to utilize sometimes one and sometimes another of the various forms of force: the spring of the wire arch, the tension of the rubber band, and the intermittent pressure of the screw and nut.

It has been my fortune to do considerable orthodontia in a strictly charitable hospital. After more than twenty years' experience I am convinced that, with the use of bronze for expansion arches, and of bronze, German silver or copper for bands and tubes, there is less liability to caries of the teeth and infections of the gingiva and other tissues, than when the precious metals are used.

THE THIRD MOLAR IN ORTHODONTIA*

By Dr. C. d'Alise, Naples, Italy

I THINK that everyone of you has read with great pleasure "Physical Fitness and the Dental Physician," an address given before the Eastern Association of Graduates of the Angle School of Orthodontia, and published in the *Dental Cosmos,* December, 1927. Nobody, in fact, had before judged more worthily our work in the present circumstances of medical science, and no one had assigned to the contemporary dentist so important a task in the regeneration of the human race. Whether he be called stomatologist, medical dentist, or simply dentist, or orthodontist, the title is no matter—what he needs is sufficient medical culture to fulfil the mission to which he is summoned.

The elevation of orthodontics as a specialty of medicine and surgery is very recent, but it not only already shows complete scientific maturity, but will in time demonstrate whatever useful value there is in the surgical and medical progress of these last fifty years of laboratory work and show how damaging for contemporary medicine it is to deviate from the logical direction. It leads to real and permanent progress, the study of the healthy and sick man. Nobody would dare deny the importance of the studies of bacteriology and physiologic chemistry, but have these studies been conveniently and opportunely valued? Have they effectively improved man's physical conditions? Have they diminished the frequency and gravity of human diseases?

If we look at the therapeutic means in use today, if we consider the great progress of general and special surgical technic by which illnesses that before meant certain death are today completely cured, we must affirm that these last fifty years have truly revolutionized the medical science, have really marked a great progress in curative medicine, but not in prevention, and so much less in eugenics, that, facing these undoubtedly good results, is the increased human morbidity and the increased frequency of the acute and chronic diseases of man, which will inevitably lead in the near future to increased mortality. And, therefore, we cannot call it true progress if at the same time we find a deficit and damage of human health, a deficit that in no organ, in no apparatus of the body is so evident, is so accentuated, as in the dental system. A decayed tooth, however scientifically cured and filled, is always a minority organ in its structural and morphologic integrity, and is also the expression of a pathologic state of the entire organism; the pyorrhea alveolaris, even if radically curable, and it is not, is always the expression of an alteration of the tissues surrounding the tooth (alveolus, peridental membrane, gum, etc.) and is also the expression of a defective functional and constitutional state of the entire organism; dentofacial deformities are not

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only abnormalities of the dental arches themselves, but in close relationship with alterations of the face and its organs. And then how can it be sustained that medicine progresses if the constitutional and organic state of man becomes worse? And it is not to be said that the decadence of the teeth of men at the same time represents a period of transition, of beneficial crisis that precedes the period of real improvement in the human race, as we see daily that the degeneration of our teeth is accompanied by a similar degeneration in other parts of the entire organism.

It would be enough only to examine even superficially the effects of dental malocclusion to convince ourselves at once that the other structures of the face are also abnormal and the fundamental functions of the vegetative life—respiration and digestion—altered. And it is surprising how this fact has completely escaped the medical class in general.

Moreover, as Emerson well says, the physician of today occupies himself almost exclusively with the sick man, or to say better, with actual illness without searching for the organic and remote causes that have prepared it, and trusting too blindly to the laboratory, has neglected the study of human nature, which has been at all times the best and surest fount of medical progress.

Among the anomalies of the dental system of the present generation, the most frequent and most significant is the alteration of form and position and the gradual disappearance of the third permanent molar. Further, this tooth which in the remote and near past was the biggest and strongest molar, now continuously becomes smaller. What is then the meaning and consequence of these facts?

Many have interpreted them as evolutionary signs of progress in mankind. For them in man the life of relation would have the advantage over the vegetative, and in the head the skeleton face, that is in close relationship with the dental system, would reduce itself in volume for the benefit of the skull; and so by law of biologic evolution the human organism would tend to get rid of all that is of no more use for the new conditions of life. For them the function of the teeth, reduced to a simple mechanical action of grinding food, would not require a vigorous action of the masticatory muscles, acting on four couples of premolars and six pairs of molars, owing to modern alimentation, thanks to the progress of chemical physiology and other subsidiary means, and this view is supported by the studies of F. von Oefele, Keppel, and Michel, who have shown that for the digestion of starch in the present conditions of human alimentation the work of four pairs of premolars or molars is enough.

However, we are not of this opinion, and to the degeneration of our teeth, to the gradual disappearance of the third molar, we give a meaning of degeneration and regression of the human organism, and we hold that it is not by mutilation and reduction of volume and number of some parts that the organism progresses and evolves, but by harmoniously developing all its parts; that, if we see that some parts, some organs sicken frequently and are the causes of diseases of other organs, this does not authorize us to hold that

they are useless and damaging, but rather to consider that we are ignorant of their use and of the near and remote causes of their alterations.

It is to be noted that in recent times another organ of the digestive apparatus, the vermiform appendix, becomes ill with a frequency and an impressive gravity which induce some physicians and surgeons to advise preventive extirpation, even when it has given no real trouble and is considered perfectly healthy, just with the idea that, having no function, it represents a danger for the individual. Today, however, calm and patient studies lead us to revalue this organ, attributing to it very important functions. Now, this happening with an organ far from our sight and direct observation may be excusable; on the contrary, it is unpardonable to hold such ideals also for organs that are under the direct control of our sight and will. In fact, if for the digestion of the starch in the present alimentary conditions of civilized man four pairs of premolars or molars are enough, why has Nature furnished man with four pairs of premolars and six pairs of molars? Would the Creator have so erred in the formation of man, or is it man who has erroneously interpreted the function of the dental system and the digestive apparatus and has consequently altered the aliments in this biochemic composition and consistency, rendering them improper for human nature? We are of this latter opinion, and on another occasion we shall demonstrate it, that is, when we speak of the dental system in human alimentation; while today we shall occupy ourselves briefly with the cause and effects of the gradual disappearance of the third molar.

There is no physician who does not know, who has not seen, at least sometimes in his professional practice, the serious consequence of the difficult eruption of this tooth. Yet how few among them have studied and know its physiopathology! And it may be affirmed that even among us, dentists and orthodontists, there are few able to give an exact account of the importance and meaning of this pathologic occurrence, the frequency and gravity of which has given rise to the suggested preventive extraction of the first permanent molar to leave room for the third. However, we orthodontists, who see daily how the precocious fall of the sixth year molars is one of the most frequent causes of malocclusion, cannot accept this useless and damaging mutilation but must instead search for the near and remote causes that lead to the gradual disappearance of the third molar, and deal with its preventive cure.

Examining the head in its entirety, we note that it is made of a container, the craniofacial skeleton and the soft covering parts, and of a content, the brain and its organs of specific sense; that to the skeleton are attached powerful muscular masses, in very great part represented by mastication muscles, which serve to put in movement the mandible, the unique movable bone of the head itself, and the normal development of which is conditioned, as for the other parts of the skeleton, by an active working of the attached muscles.

Now it seems strange to us that while in the modern life there is a complete re-awakening for gymnastics of the trunk and limbs for improving the physical development of man, as did the Greeks and Romans; for the head,

instead, the progress of physiologic chemistry, erroneously understood and applied, leads almost to complete inertia of the masticatory muscles, with a consequent deficient development of the face bones in general and the mandible in particular, the gradual disappearance of the third molar being the most characteristic sign of this. Yet it is in the mouth, it is in the dental apparatus, that we more often and more clearly see how its function develops and keeps the organs perfectly normal.

In fact, if we return to the mechanics of mastication, we note that in these the mandible acts as a lever of the third kind, in which strength is represented by the masticatory muscles, the resistance by the foods and the fulcrum by the temporomaxillary joint. Then it is obviously to be inferred that in mastication the farther we go from the opening of the mouth to the angle of the mandible the greater is the muscular power of contraction, and consequently the third molar has a masticatory power greater than the other two, and therefore its larger size and robustness. Today, instead, foods for human alimentation being reduced to a state of pap, the third molar has no longer any masticatory exercise on food and so becomes an inert atrophy and tends to disappear.

So, knowing the principal cause of the decadence of the third molar, what what are the consequences of it and what the providence? If we examine the mandible of the child at the time of its complete deciduous dentition and follow it during the whole of its development, that is till it is adult, we note how the development of the horizontal branch of this bone proceeds, above all, from the second deciduous molar to the angle of the mandible, and that is why in this region the muscles of mastication take the attack and exercise their maximum stimulating action. Now it is logical to infer from this fact that an insufficient masticatory function brings as an immediate consequence an insufficient development of all the mandible, and more especially of the region that must contain the three permanent molars. An equal lot, and for the same reason, falls to the maxilla, and consequently also to the upper bony structure (nasal fossae, orbitary cavities, maxillary sinus, etc.) as has been amply proved by the pathologic anatomy (Cryer, Bogue), by experimental pathology (Lanesberger, Baker), and the clinic. And also we, in preceding works, have shown how normal and vigorous mastication is necessary for the normal development of the nasal fossae and that dental malocclusion brings a diminution of the respiratory capacity to the individual. But apart from all this damage due to inertia of the muscles of mastication we would here consider another occurrence, the influence that the abnormal development of the third molar exercises in the production of the third class of malocclusion. (Angle's classification.)

For several years I noted, to my surprise, that in patients I had seen immediately after the fall of all the deciduous teeth and their relative substitution by permanent teeth, with dental arches perfectly normal, the production of some malocclusions accentuated themselves in measure as they approached the eruption of the third molars. An attentive and repeated examination executed on many subjects has given me the explanation of such fact and has explained to me also how some malocclusions of all the classes scientifically

correct and contained for a long period of time, have given some relapse. The cause of this was to be attributed to the third inferior molar, which at its eruption not having found the bone space sufficiently prepared by a preceding useful masticatory function, had then transmitted its force of eruption on to the dental arch, displacing its various elements in the direction of minor resistance, provoking now a mandible protrusion, now a first-class malocclusion and often a relapse of malocclusions completely corrected.

And this fact explains also the reason for the frequency of the malocclusion of the permanent teeth.

In concluding these brief considerations we may affirm:

(1) That the gradual degeneration and disappearance of the third molar in man is a sign of the decadence of the human race that interests as much the physician as the dentist and the orthodontist.

(2) That the masticatory function, badly known and little studied by the majority of modern physiologists, has made the natural direction of contemporary medicine completely deviate in regard to human alimentation.

(3) That the abnormal development of the third molar is a frequent cause of malocclusion. (First- and third-class Angle's classification.)

(4) That in correcting a malocclusion, beyond the necessary contention, it is necessary to reestablish a normal and vigorous masticatory function, without which one gets frequent and inevitable relapses.

(5) That, last, the study of the physiopathology of the dental system should constitute the first step in the reform of contemporary medicine for the improvement of the human race.

THE INTERRELATION OF CAUSES, FACTORS AND TREATMENT IN ORTHODONTIA*

By Andrew F. Jackson, D.D.S., Philadelphia, Penn.

NOTHING is more fatal to a correct estimate of any subject than lack of proper perspective. In considering the orthodontic problem, it is, therefore, essential to take a wide excursion in the realm of our acquired information in order to arrive at some idea of its nature in a cosmic sense. Any narrow-minded view in this matter is fatal to a true conception of the field of usefulness of orthodontic treatment with its attendant possibilities and limitations.

In order to be successful in any line of work it is necessary to determine as far as possible the basic principles or the fundamental philosophy of its nature.

With this objective in view we must accept the fact that from a scientific standpoint we have only some very incomplete information regarding living tissues and that, to arrive at any conclusions at all, we must supplement this with some philosophic speculation. In the last analysis we may even have to include some theological speculation.

However debatable our conclusions may be, we should at least formulate an hypothesis upon which to base our efforts in treatment, which we trust will contain some elements of logical harmony with conditions as we find them. The results of treatment are the final arbiter as to the soundness or fallacy of these conclusions.

In order to hold ourselves as concretely as possible to the problem in hand we must consider that biologically each human individual is a result of his heredity, plus his living activities and environment. Spencer has stated this to the effect that life is a continuous adaptation of internal conditions to external conditions.

Whether we accept the theory of evolution or the biblical story of the Garden of Eden, it is quite reasonable to suppose that it is part of the Divine plan that man should possess an organism which would be in harmony with his surroundings to enable him to make his span of life on earth a satisfactory one.

From a physical standpoint it seems quite clear that man's organism is capable of effecting a satisfactory balance if subjected to certain conditions. This is demonstrated by the American Indian, the Eskimo, and practically all our anthropologic prehistoric data. These conditions demand a vigorous form of existence in order to eliminate the unfit, combined with a homogeneity of propagation and living conditions, over a long period of time. Man was sub-

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jected to just these conditions for long ages of time before recorded history. Our orthodontic problem has arisen from certain changes which have taken place in these conditions comparatively recently in comparison to the length of those periods of time.

Man was destined, however, to inherit the earth. Since he has done so, it is a questionable matter of how good a job he is doing; particularly in regard to the treatment of himself, in view of the latitude that has been given him in the matter of his personal liberty. Along with the biologic problem this volitional element in the life of man is the other great underlying factor to be considered in the ultimate destiny of the race including, incidentally, his dental equipment.

The factors that are basically responsible for the orthodontic problem are, therefore, the changes in environment and nutrition which man has undergone, the result of crossbreeding of different types and races and, pervading it all, that intellectual, volitional, spiritual element which dictates his actions in either the right or the wrong direction with their subsequent effects upon his physical make-up.

The real solution to the orthodontic problem in man lies in the development of his intellectual and moral qualities. All the religious speculation and philosophic reasoning of the world are involved in the problem.

The combinations which these factors are likely to produce are staggering to contemplate if out of this material we attempt to define what constitutes an individual normal. Looking at the problems from this standpoint it would appear almost hopeless to coordinate our efforts when our goal is undefinable. It is certainly conducive to a certain humility of spirit in our considerations. Any preconceived idea as to the final arrangement of the teeth for a given individual, without taking into consideration all these factors, would appear untenable.

Any organism in changing over from one set of conditions to another can very logically find itself, temporarily at least, out of harmony with its surroundings, causing a condition of unadaptability in some of its organs. Of all man's organs the teeth are the only ones which are unsusceptible to changes in volume ofter they have been determined at a very early period in his embryology, and it is, therefore, quite logical that these are the ones most frequently out of harmony with their ideal arrangement.

From the anatomy of the teeth, as well as from their location in the skull, we have a fairly good conception of what the arrangement should be under ideal conditions. Our problem is, what to do when this arrangement does not obtain, and is concerned basically with the biologic and psychologic factors involved.

When because of natural limitations the ideal arrangement to be desired seems unfeasible of attainment, judging from past experience in treatment, it is perfectly justifiable to seek a satisfactory compromise.

If we are to be of any use as orthodontists, we must know the facts, accept them as we find them, and confine our efforts within the limits which experience has taught us as possible with all our faculties open at all time to improvement in methods of coping with conditions.

Orthodontists should congratulate themselves in being engaged in a work which contains so much of the elements of the creative and artistic. The ultimate value of an orthodontist to society does not depend so much on the extent of his knowledge of the branches which are collateral to the problem such as biology, physiology, psychology, etc., as upon his ability to apply, in a practical way to the problem on hand, what knowledge he does possess.

In considering the orthodontic problem proper in a practical manner three questions present themselves in logical order:

1. Why do we have malocclusion?
2. What is our objective in orthodontic treatment?
3. How may we accomplish desirable results?

The position of the teeth from the orthodontic standpoint must be considered as merely the end-result of the action of an involved series of forces. The result of the actions and reactions of these forces finally terminates in a state of balance, peculiar to each individual. This may be considered satisfactory or unsatisfactory, as the case may be.

It, therefore, seems logical to approach the problem from the standpoint of the active causes, which are these forces, and to coordinate our available information in a classification which will rest on this basis. Malocclusion of the teeth may, therefore, from this viewpoint and for convenience sake, somewhat arbitrarily be grouped under the following four headings:

1. Disharmony in the biologic proportions between the amount of tooth substance and jaw development.

2. Incorrect functional activities of the individual with particular reference to the muscular activity controlling the relation of the jaws to each other.

3. Mutilations, such as prematurely extracted teeth and loss of other tissues.

4. Abnormalities, such as supernumerary and congenitally missing teeth, cystic formations and other abnormalities and malposition of the teeth which cannot be classified under headings 1, 2, and 3.

Disharmony in the biologic proportions of the teeth and jaw substance is basically a biologic problem.

On account of the lack of definite necessary information, orthodontia offers a very speculative element in many of its most important phases. The amount of tooth substance inherited by the individual is determinable, but the amount of bony development to accommodate this tooth substance is not determinable, and from the biologic aspect, resolves itself into a question of judgment on the part of the operator as to how much normal bony development may be expected for any individual case and, if not sufficient, how much more may be produced by mechanical stimulation. One thing is certain, that, unless sufficient bony development is obtained not only to accommodate the teeth but to produce that state of *balance* which will not be affected by the other forces involved, no permanently satisfactory result may be expected.

The problem does not end here either, as no result can be considered satisfactory unless the proportion of teeth substance and bony development is in

harmony with the balance of facial development. In the light of practical observation, there are many cases where the tooth substance is entirely out of harmony with facial development, even after this has reached its maximum. It is obvious how difficult it is to lay down any hard and fast rules to govern treatment, especially during the formative period when there is no method of determining at what *age* and to what degree development will occur. Certain it is that every element which will promote normal bodily growth should be utilized, especially in the hands of a competent pediatrician, and that orthodontic interference should be looked upon merely as an aid to such treatment. There is a *biologic limit* to bony development of the jaws in proportion to other bodily factors. One of the great factors in orthodontic failure is due to lack of judgment in this particular.

The biologic and artistic features can only be handled successfully by the utmost delicacy of judgment. The acquisition of this, like all other forms of art, can only be obtained by long experience, keen observation and artistic feeling.

When malocclusion is due to incorrect habits or functional activities of the individual, which from the orthodontic standpoint are mainly associated with the voluntary muscular activity of the parts involved, the problem is basically psychologic in nature. Mechanical interference to arrange the teeth so as to make it possible for the jaws to function normally is of indispensable importance, but the degree of success obtainable will depend mainly upon careful and intelligent instructions on the part of the orthodontist as to the proper use of the muscles involved, accompanied by all the cooperation possible on the part of the patient. Appliances should be so devised that they will be a constant reminder, by the physical presence, as to what the correct function should be. The degree of cooperation which can be obtained is another of the indeterminable factors of orthodontic treatment, but upon this factor will depend the degree of success obtainable. There is great truth from the orthodontic standpoint in Lamarck's statement that "Form is the result of functional activity." Undoubtedly form and function go hand in hand, the one directly affecting the other.

Mutilations and abnormalities from the causes already mentioned but add to the complications in orthodontic treatment. Their solution depends primarily upon the biologic, psychologic and esthetic factors involved, with final recourse, if necessary, to surgical interference and prosthetic restorations.

Based on the foregoing considerations, therefore, the *object of orthodontic treatment* might be stated as: The best arrangement possible, within biologic, functional and esthetic limitations, to produce the most efficient and artistic organ of mastication.

This means a rearrangement of tissues from a balanced undesirable condition to a more satisfactory arrangement which will again be balanced.

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changes in functional habits; surgical interference and prosthetic restorations and all the means available to promote the highest standard of physical and mental well-being. The high art of orthodontic treatment depends upon great vision and foresight in weighing all the factors to be considered in order to achieve a result which will be satisfactory and possible of attainment. The permanent result of any orthodontic effort will depend upon the balance of all the forces involved.

When actual mechanical treatment is instituted, several very important factors must be considered which experience in treatment has disclosed. All mechanical force, being extraneous in its nature, produces biologic changes in the tissues affected. It is a matter of common knowledge to experienced orthodontists that movement is more easily obtained during the early period of treatment than later. There is a time limit to which the length of mechanical treatment is desirable. At the present time this matter is open to a wide difference of opinion among orthodontists.

One of the most difficult problems with which he is constantly confronted is the time at which mechanical interference is most desirable. A biologic disharmony which is apparent at an early age may be entirely overcome by natural processes at a later age, and the application of mechanical stimulation at the wrong time may be not only entirely unnecessary but actually harmful. Further, the end which he would like to achieve may be found to be impracticable when the full development of the individual has taken place, producing a totally unsatisfactory result which will necessitate a considerable amount of further treatment to effect a compromise which will be satisfactory. Taking all the factors into consideration, it would seem that in cases of biologic disharmony, the inflexible rule of striving in all cases for a denture with a full complement of teeth is both untenable in conception and impracticable in application. This conclusion is based on personal experience, as well as on observation of the result of others. The decisions to be made in this class of cases are among the most difficult to be made in the practice of orthodontia. It must be taken into consideration that in producing room in each jaw for the accommodation of teeth, force can only be applied in buccolingual and mesiodistal directions. Force in the mesiodistal directions produces effects in the region of the third molars which in many cases are undoubtedly impacted thereby, producing the necessity of their extraction. In many cases it is simply a question of choosing between the loss of these teeth as compared to others more mesially located. In cases of this kind the size of the teeth, the general bodily development, the size of the oral cavity, the bony development of the alveoli, and the muscular tone of the parts involved are the factors to be considered. It is my policy not to begin treatment any earlier than absolutely necessary.

In cases of incorrect relation of the jaws due to function, the problem is not quite so difficult. All function is intimately related to form, and when this is incorrect, the tendency toward further deformity is a logical sequence. It would seem logical, therefore, that the sooner treatment is instituted, the sooner will the tissues be directed toward normality. This is undoubtedly

the case in most instances, but the degree of cooperation that can be enlisted on the part of the patient is, in most cases, the important factor. This factor is generally dependent upon the age and mental attitude of the patient. A considerable amount of time and effort, which might be wasted at an early age, might be exceedingly productive of results at a later age, without subjecting the tissues to the harmful effects of too long an interference of a mechanical nature. This refers particularly to cases of distoclusion. In cases of mesioclusion or linguoversion of the maxillary incisor teeth, and cases of cross-bite, the earlier treatment is instituted, the better, as these cases very often require very little cooperation on the part of the patient, and the deformities, if allowed to continue, are rapidly progressive.

The complications which combinations of these four groupings can produce are limitless and can only be discussed in terms of generalities. The results to be obtained are dependent, in last analysis, on the inherent artistry of the operator. Because of the vast difference of opinion among orthodontists, any expressions here given can only be taken for what they are worth as personal opinions.

The premature loss of any tissue is to be deplored, and any means to avoid malposition of teeth due to drifting, from lack of support, should be aided by mechanical means at the earliest moment.

Long experience in general practice has created the opinion that all prosthetic restorations should be used as a last resort. In cases of missing teeth, all means within artistic limitations should be used to close up spaces, even going so far as to resort to extractions to harmonize tissue substance between jaws. The employment of full x-ray examinations is absolutely necessary in diagnosis to discover in advance all congenitally missing teeth, cystic formations, etc.

When mechanical interference is deemed advisable, there is a great wealth of material in the way of designs in appliances which are at the disposal of the discriminating orthodontist and should be selected in their relation to the physiologic nature of the work to be performed. In this respect again there are violently contrasting differences of opinion among orthodontists as to the manner in which the work should be performed. There is a wide difference in this conception between the users of those very positive types of appliances as the pin and tube and ribbon arches and the users of appliances employing gentle pressure from auxiliary springs.

The mechanical forces utilized during treatment should be in accordance with biologic and physiologic laws. Nothing is truer in this connection than Milo Hellman's statement that "Teeth move in response to mechanical stimulus but not according to physical laws."

Among the qualities to be desired in appliances might be mentioned the following: ease of manipulation, ability to produce gentle continuous pressure to induce physiologic movement of crowns and roots of teeth with a minimum of trauma during movement but at the same time with sufficiently definite action not to hinder progress undesirably, self-limitation of action and ability to produce different types of action to be carried on at the same

time without the one interfering with the action of the other. This latter refers to cases where it is desirable to produce changes in jaw relations simultaneously with the action to induce bony development and individual movement.

The technical details of the appliances I have found most useful in my own practice have been described to some extent in the article appearing in the January, 1929, issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY, and it is the object to present here merely some additions to that material.

I believe it is possible to accomplish practically every conceivable type of tooth movement by the use of labial and lingual appliances with auxiliary springs. I also believe that all force should be of the gentle continuous variety which is best obtained by auxiliary springs.

All mechanical tooth movement is accomplished by either a push or pull force. The positions at which these forces are applied are the determining factors as to which is the more desirable for any given effect to be produced. Fig. 1 illustrates in diagrammatic form the positions at which these forces

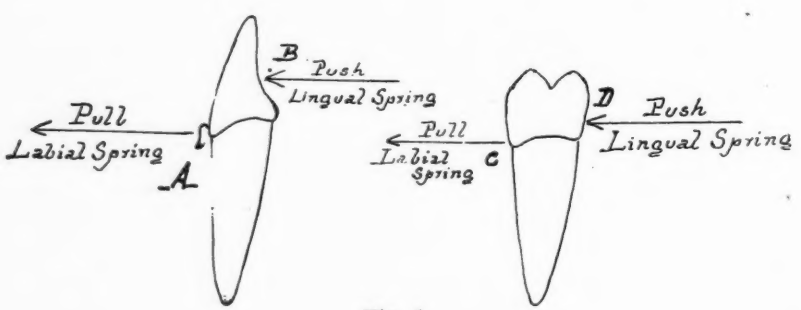


Fig. 1.

are usually applied. A pull applied at *A* has the effect, in almost all cases, of moving a tooth bodily, root as well as crown, without any depressing effect of the tooth in its socket. A push applied at *B* has the effect of moving the tooth in the direction to which the push is applied but also of tilting the tooth labially, as well as depressing it in its socket. This applies to all cases where the push is placed on an inclined surface, as on incisor teeth. Either one of these effects may be desirable or undesirable, depending upon the nature of the case. A pull applied at *C* or a push at *D* does not usually make much material difference, as the push at *D*, as on premolars and molars, is against a straight surface and does not produce tilting or depression.

In most cases, where premolars or molars are to be moved, the push obtained from an auxiliary spring on a lingual arch is preferable to a labial pull on account of the greater simplicity of the construction of the necessary appliance.

The details of the construction of the labial appliance with auxiliary springs, which I have been employing in treatment, has been dealt with in an article published in the January, 1929, issue of this journal. I wish here to describe the construction of the lingual arch including the lingual lock and the reasons for employing this type.

Fig. 2 illustrates in diagram the construction of this lock. A section of round tubing, of desirable length, is soldered on the band in the distolingual area, and a bracket hook is soldered in the mesiolingual area. The construction of this bracket hook is illustrated in its successive steps. A piece of 0.030 wire is bent as in *A, B, C* and *D,* and soldered to the band just above the gum line as in *E*. This is then cut off, leaving only a sufficient length for the arch to rest upon. A section of 0.022 wire is then soldered to this at a point just above the mucous membrane so that, when it is finished, it will neither impinge on nor stand too far away from the mucous membrane and cause irritation either to the mucous membrane or the tongue. A short section of this is cut off and a ball melted on the end as in *F* and *G*. The section of wire, fitting into the tube, should be soldered to the lingual appliance in an offset joint as shown in *I*. This permits the lingual appliance to fit snugly against the band, which would not be possible if a butted joint were em-

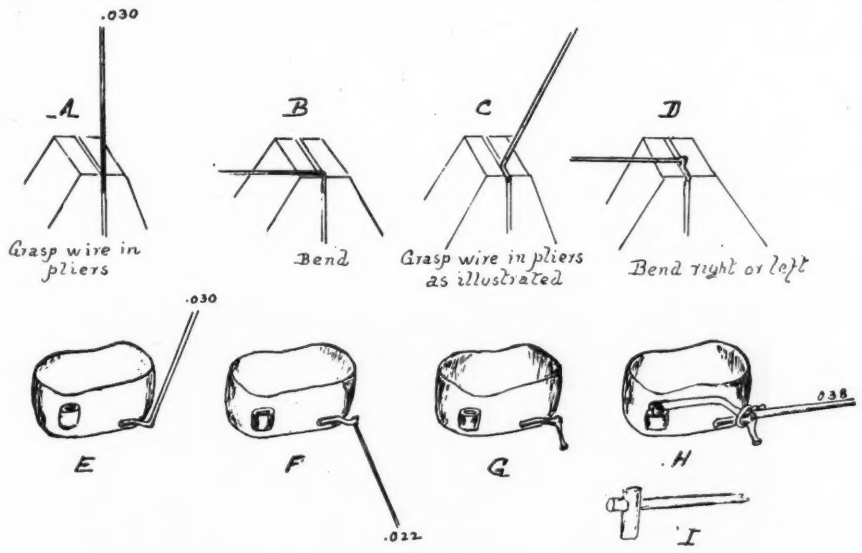


Fig. 2.

ployed. The lock is completed by tying the lingual appliance to the bracket hook as shown at *H*. This is done with ligature wire, and the ends of the wire are tucked carefully away between the body-wire and the band between the molar and the premolar.

Some reasons for using this type of lock are illustrated in Fig. 3. Occasionally there are exceedingly short teeth to be dealt with as in *A*. This type of lock may be employed very satisfactorily by making the tube a mere ring. The two points of support, the tube and the bracket hook, make the anchorage quite stable without any gum irritation. When only one point of support is employed, as is the common practice with the half-round tubing, the stability of the appliance depends upon the length of the tube of the lock.

I have found it very desirable to support the lingual body-wire by means of bands, cemented on the incisor teeth, with knobs or hooks conveniently located to allow the lingual appliance to lie snugly under them. In inserting

a lingual appliance, under these conditions, the round tube is a great advantage, as it allows one end to be inserted first, permits the post to rotate within the tube and thereby makes it possible to swing the body-wire in under these knobs to the point where the post on the opposite side can be inserted in its tube. This is illustrated in *B*.

In the construction of lingual cribs, as illustrated in Fig. 3, *C* and *D*, this lock also permits of a stability which is very desirable. For extra stability,

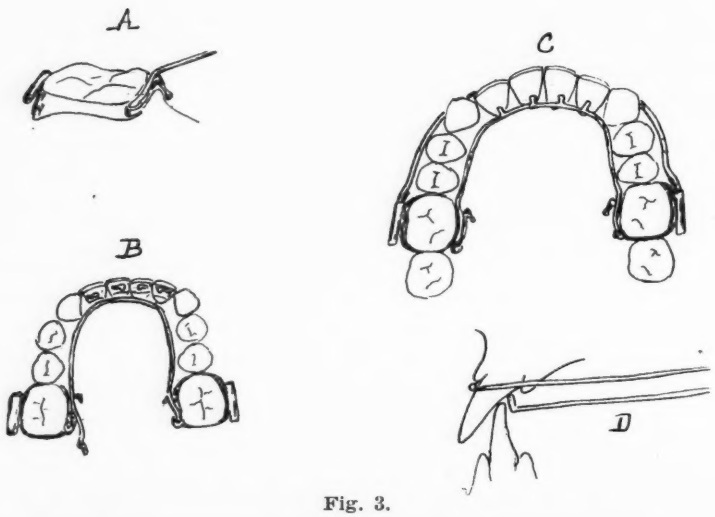


Fig. 3.

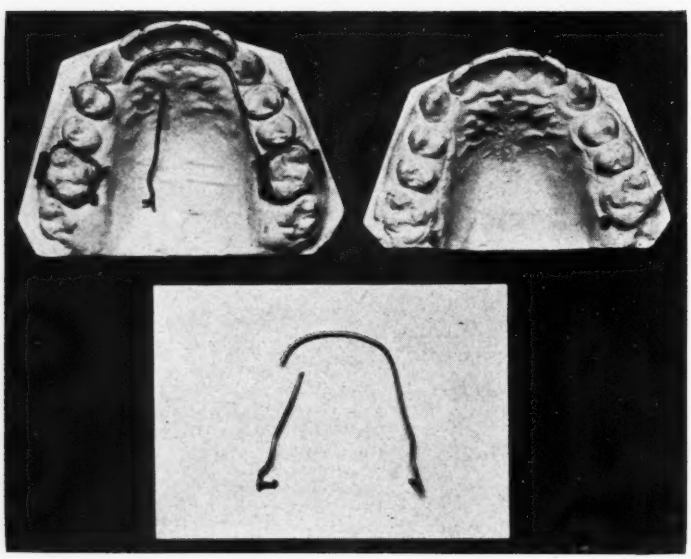


Fig. 4.

occasionally very desirable, extra bracket hooks may be soldered on bands on the premolars. This makes it almost impossible of displacement without intentional purpose on the part of the patient.

I make all my lingual appliances directly in the mouth as illustrated in Fig. 4, making them in two sections and soldering them together by a lapped joint. The use of the round tube makes the construction of lingual appliances

a much simpler matter under these conditions than when half round tubing is employed. The making of lingual appliances in situ, when they are to be employed as cribs, is of great benefit, as it permits exact observation of the bite in its relation to the most desirable position which the crib should occupy.

When intermaxillary elastics are employed, the usual custom is to attach them from the posterior ends of the buccal tubes to hooks on the appliances of the opposite jaw. When an intermaxillary elastic is applied in this manner from the mandibular molar, the result is to tilt the molar forward. When the molar band is attached to a lingual appliance, the action tends to depress the incisor because of pressure on the inclined lingual surface. The action of these rubbers is to draw the molars anteriorly, and where only an unsupported lingual body-wire is employed, the effect is to reduce the space and crowd the mandibular incisor teeth. Depending on the case, this may cause very undesirable effects by producing open-bite. To obviate this, if the lingual

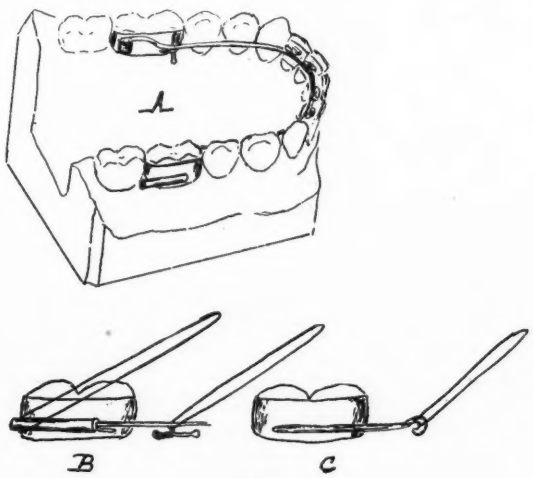


Fig. 5.

appliance is stabilized by having it lie snugly under knobs attached to bands on the incisor teeth, buckling can be avoided. If, instead of attaching the rubber to the posterior end of the buccal tube, a bar with a hook on the end is soldered to the buccal surface of the molar band and the intermaxillary elastic is attached to this hook, the effect will be to tilt the molar posteriorly and this will be transmitted to the incisor teeth through the lingual appliance. These will be elevated instead of depressed, and the result will be to close the bite. I have found, from actual experience, that this method of dealing with this particular problem is of great practical value. This is illustrated in Fig. 5. The hook at *C* can be made of any length depending on circumstances. Likewise, if a labial appliance is being used, the hook for the intermaxillary rubber can be attached at any chosen point on the arch as in *B*.

When intermaxillary elastics are used from the posterior ends of buccal tubes on the maxillary molar bands, customary in the treatment of mesioclusion cases, the action is to tilt the molars mesially. If a lingual appliance

is employed in conjunction, the effect is to depress the incisor teeth by the pressure exerted on the inclined planes. This is exceedingly undesirable and may prove disastrous where the case is an actual open-bite case or has a strong tendency in that direction. To obviate this and produce the opposite result, a hook soldered on the labial appliance, as in Fig. 6, *A*, completely reverses the action of the intermaxillary elastic in this respect. An inter-

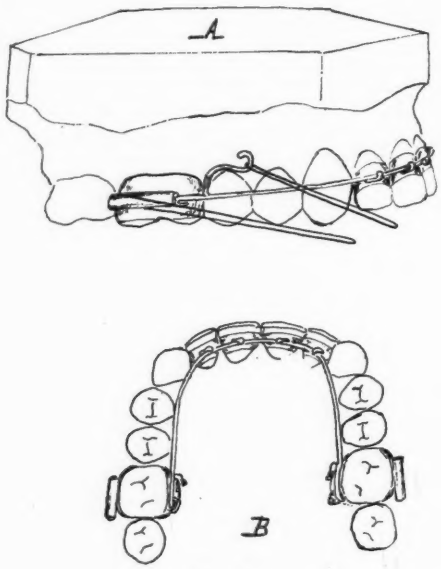


Fig. 6.

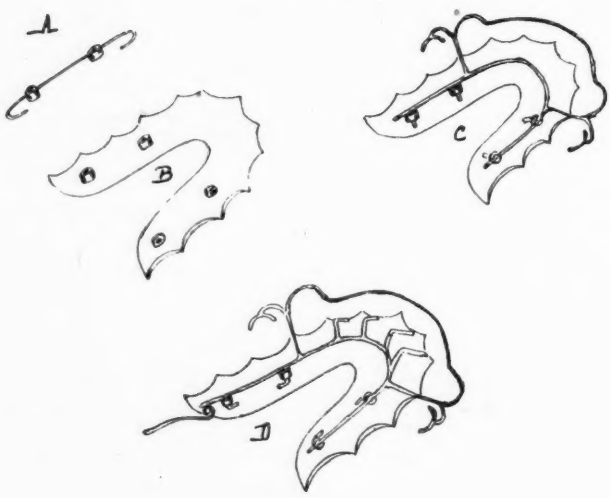


Fig. 7.

maxillary elastic, attached to such a hook as illustrated, tends to tilt the molar distally. If this effect is transmitted through the labial appliance to the incisor teeth, banded with appropriate hooks or knobs, the action is to close the bite. I have found by experience that in cases of this kind, where this method is employed, that it is desirable to also employ in conjunction with the labial appliance a lingual appliance, which lies snugly under hooks or knobs, soldered to the lingual surfaces of the incisor bands.

Hawley retainers, as commonly constructed and used, are of great value but have the inconvenience of often breaking at the point where the gold wire enters the vulcanite. This often necessitates the construction of a new retainer. After considerable experimenting in my office, I and my associates, Dr. Patton and Dr. Sager, have developed a modification of the Hawley retainer as illustrated in Figs. 7 and 8. It permits of easy repairing and an unlimited variety of attachments, extremely useful not only in the retention but in the actual treatment of cases. The technic of construction is as follows: a plaster cast is obtained of the case and two sets of parallel tubes are vulcanized into the plate as in Fig. 7, *B*. These are attached to the vulcanite by soldering them in pairs to a section of wire with recurved ends as in Fig. 7, *A*. In order to preserve the original model, an impression in modeling compound is taken of the lingual surface of the model, and a second

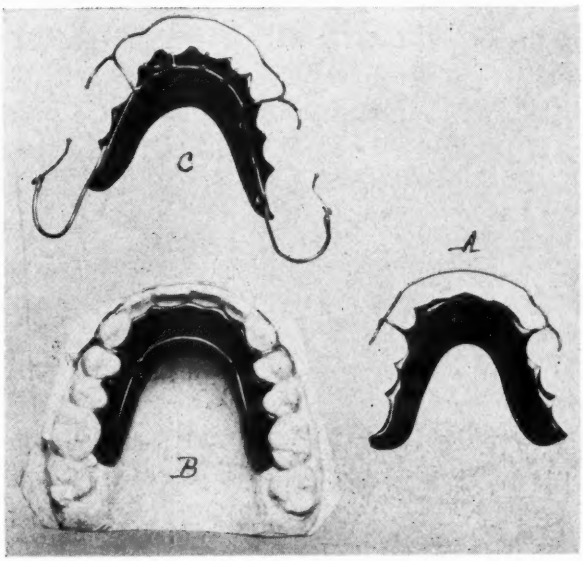


Fig. 8.

model is obtained from this. The original model returns from the laboratory holding a perfectly fitting vulcanite plate with the four tubes in place. The tubing which is used is of the size to accommodate 19 gauge or 0.038 inch wire. The removable section as illustrated in Fig. 7, *C*, is constructed of 0.030 in wire. The sections of wire which fit into the tubes are made long enough to extend for a short distance beyond the length of the tubing and by bending the protruding ends toward each other, as in Fig. 7, *D*, the removable section is very simply and securely locked in place. Fig. 7, *D*, also illustrates in diagrammatic form the construction of a removable crib and a finger spring, useful occasionally in moving a second molar to place. The simplicity and ease with which repairs and useful attachments are added to this retainer are very strong recommendations for its use.

Fig. 8 is a photograph of three retainers: *A*, the regular Hawley retainer; *B*, a regular adjustable retainer, constructed as described; and *C*, a retainer which was used in actual practice, to shorten the bite and elongate the molars.

In this last case extensions of the lingual body-wire were made beyond and around the second molars, from the lingual to the buccal surfaces, and springs were attached to these ends. They engaged hooks on the buccal surfaces of bands, which were cemented to the first molars. I have found this method admirable in dealing with cases which require such treatment—in some cases accomplishing much of the work before any regular orthodontic appliances are installed.

THE PRACTICE OF ORTHODONTIA IN SCHOOL CLINICS*

By Dr. James T. Quintero, Lyons, France
Professor of Orthodontics, École Dentaire de Lyon

AT THE last two meetings of the Association Française pour l'Avancement des Sciences discussions took place on the different aspects of dental hygiene (Grenoble, 1925) and the position in general practice of orthodontics (Lyons, 1926). With regard to the first of these subjects, many of the speakers attracted attention by the brilliant way in which they dealt with that part of the program which concerned them, the interesting work dealt with by Dr. P. E. Bousquet and Messrs. C. Cros, F. Haloua, R. Lelièvre and E. Lebrun being particularly noteworthy. The following year, at Lyons, we ourselves brought forward a report in collaboration with Dr. A. Pont, and the animated discussion which ensued showed how much importance must be attached in general practice to dentofacial orthopedics, and the interest presented by this question in general.

At a time when the French public authorities seem to be concerning themselves with the question of the health of the people by enacting a law dealing with social insurance, and when free, or almost free, clinics and dispensaries are being opened everywhere, through the generous initiative of some of our farsighted colleagues, where even advanced dental treatment is given to poor children and to their parents working in the big industrial districts, it is natural that the question should arise of how far the facilities thus available, and the conditions under which we practice our profession enable us to undertake orthopedic dentofacial treatment.

As a matter of fact, this question is by no means a new one; in different forms it has been the subject of many an inquiry, both here and elsewhere; but we shall cite only a few of the works published on the subject and shall do so partly to show the diversity of the opinions expressed, and partly to utilize the more practical suggestions and to see how they may be profitably applied in the Latin countries of Europe.

It may be of advantage to make a rapid survey of the different types of clinics where cases requiring the special treatment we have in mind may be encountered. These fall naturally into three principal groups:

(1) School clinics (including charitable institutions, etc., dealing with children up to 13 or 14 years of age);

(2) Industrial clinics (for the use of workpeople of one or more factories, and which deal with patients from after school age until retirement);

(3) Military dispensaries or hospitals, dealing with young men of 20 to 24 years of age.

*Paper read before the European Orthodontological Society.

We purposely leave out clinics attached to dental or stomatologic schools, etc., where the scientific methods applied in private practice are taught, and which must therefore be classed with private practice to a large extent. Nor do we propose to deal with the Forsyth Institute at Boston, the Eastman Institute at Rochester, or that soon to be set up in London, these being teaching institutions in which orthodontia occupies a specially important place.

We have, therefore to study, the three categories of institutions to which allusion has already been made, from the points of view of the patients frequenting them, the time the visits last and the age of the patients, and the means at the disposal of the practitioner, i.e., the conditions under which orthodontic treatment can be given.

It is obvious that, apart from the dental schools, etc., the number of clinics at which treament of this kind can be given is necessarily limited; a study of the general and particular conditions at each type of dispensary leads to the following conclusions:

School Clinics.—These are attended by boys and girls from the municipal schools whose parents are unwilling or unable to bear the expense of private treatment. These children come under the inspection of the school dentist up to the age of about 13 and may attend the clinic, on an average, for five or six years. This period, it should be noted, is one of the best for orthodontic treatment. The material facilities at the disposal of the dentist are generally of the simplest description, though this does not apply to Lyons, where children needing orthodontic treatment are sent to the dental school, and where, from October, 1928, a further extension of the service will make it possible to give them the best possible care. Moreover, at Lyons, there is a "Children's Institute" *(Maison de l'Enfance)* which deals with children whose parents are employed in certain factories in the city. This establishment, which is run by the Comité Commun d'Hygiène de l'Enfance de Lyon, sends its little patients to the Lyons Dental School for orthodontic treatment.

Industrial Clinics.—In rare cases industrial enterprises, whose directorates have realized the philanthropic, social and practical importance of such work, have shown the way by opening dental clinics for their workers. The method of running such clinics varies considerably, and their number is so small that it is impossible to generalize about them. It is to be noted that in most cases these same enterprises pay a bonus to workers with families, with the result that married men and women with families remain with them, while the unmarried workers (and especially young men who have not yet performed their military service) form a shifting population, continually changing. The head of one of the most important industrial enterprises in Lyons has stated that the floating population of his works represents about 30 per cent of the total, and consists almost entirely of unmarried people, and especially these young men. In the case of these works dental treatment is charged for, on a scale about 15 to 20 per cent below the ordinary rates.

Military Dispensaries and Hospitals.—Here only a small number of patients require orthodontic treatment while the practitioners themselves are fresh from the dental schools and lack experience and are little inclined to give it. Often they are out of touch with the experienced heads of their service, and,

moreover, their patients are continually being moved from place to place, often unexpectedly; while both patient and practitioner are undergoing a period of instruction which is always short and often insufficient for the treatment of a difficult case.

This short outline shows that it is only during the school period that it is possible usefully to undertake orthodontic treatment, because only then is it possible to keep in constant touch with the patients. It is difficult to see, moreover, how a worker or a soldier can find the time necessary for undergoing a long and continuous treatment, even supposing him to be sufficiently young for it to be undertaken with some hope of success. It is, therefore necessary to limit oneself, as we shall see later, to taking certain measures which, while not constituting an orthodontic treatment proper, may be considered as active prophylaxis. Thus, outside the dental schools, orthodontic treatment can be given only in school clinics.

However, all those who are engaged in running these school clinics will tell you it is impossible, with the means at their disposal, to think of undertaking this work. Still, have we the right to deprive the patients of these clinics of services we should certainly render to private patients? Are not their rights the same? Who has ever heard of a doctor or a surgeon refusing to his charity patients the treatment he would give in his private practice? Would not the opinion of his colleagues condemn such conduct, if his own conscience did not do so? The same feelings of humanity and justice compel us to make no distinction between poor patients whom we treat at clinics, and those whom we receive in our private practice.

There we have a guiding principle for our conduct: we ought, so far as possible, to treat clinic patients and private patients alike. I say "so far as possible," because from an orthodontic point of view certain limitations are imposed by the method of functioning of the clinics, the type of patient who attends them, and the occupations of the practitioner who carries out the treatment.

The factors which condition orthodontic treatment in clinics fall, therefore, under three heads: those which concern the dentist, the patient, the place of operation, and the material at the disposal of the practitioner.

In the case of most school clinics, we find that sometimes the clinics are run by a whole-time salaried dentist, and sometimes one or more dentists devote a portion of their time (usually several hours a week) to them in turn, usually on a more or less honorary basis. The patients are so numerous that little time can be devoted to each, and the conditions are, therefore, very unfavorable for giving treatment which requires constant supervision, by means of numerous visits at short intervals. On the other hand, especially when the treatment is given free, it may be impossible to find the money for orthodontic appliances. It is, therefore, obvious that the conditions under which the majority of clinics have to work are themselves a serious obstacle to the treatment of orthodontic cases.

The social position of the patients is also an obstacle. The patients are usually either school children or the children of workers who attend the clinics, and they have very little time for dental treatment; their studies claim all

their attention, or their parents are unable or unwilling to afford the long and continuous care required. The second obstacle, then, comes from the patients themselves.

The dentist, moreover, himself meets with many difficulties; his work leaves him very little leisure in which to examine orthodontic cases in the way they deserve, decide on the most suitable method of treatment and apply it. Even if time is not lacking, experience may be, and he may hesitate to launch out into the unknown, not knowing how to begin what, to another man, might be quite easy. Or it may be the clinic does not provide him with the material and instruments he requires, and discouraged by so many apparently insurmountable obstacles, he may refrain from undertaking treatment, although some quite simple intervention might improve the appearance and often the mastication of the patient.

What can a dentist in a clinic be expected to do in the way of orthodontic treatment? Obviously, only the very simplest things; he must limit himself to treating the easiest cases by the simplest methods, for, as we have shown, long

Fig. 1.—Labial eruption of an upper left canine in a child of 12.
Fig. 2.—The same case one year after extraction of the first premolar.

and complicated treatment of difficult cases is impossible. If we limit ourselves to the simplest cases and the simplest methods, what is open to us? We have the choice of only a small number of processes—extraction, immediate rotation, dislocation, surgical straightening—none of which necessitates the use of costly or complicated apparatus, and simple enlarging apparatus—the simplest and easiest to construct and fit. It will be seen, therefore, that the cases susceptible of orthodontic treatment are not the same in clinics as in private practice of a general kind. In the latter case, as I showed in a paper written in collaboration with M. Pont for the 1926 Congress of the Association Française pour l'Advancement des Sciences at Lyons, the general practitioner can deal only with cases where the teeth themselves are defectively placed, an experienced orthodontist being consulted in more difficult matters. For clinical work the field of action is even more limited, and must be confined to matters of necessity rather than of deliberate choice.

What cases can be treated? What treatment can we apply? In the first place, among the cases which can be treated are those where the canines take up a labial position because of lack of space between the lateral incisors and the

first premolars (Figs. 1 and 2). Cases which in private practice often call for long and complicated treatment can often be considerably improved by quite simple treatment. Cases of rotation of one or two teeth can be improved by simple means which are easy to apply. Cases of superior protrusion and of marked protrusion of the incisors, with or without inferior retrusion, seem too difficult to be dealt with under the conditions in which practitioners and patients are placed in clinics, and *à fortiori* it is impossible to deal with those where not only the teeth, but also the face, the articulation and the maxillae are affected.

What therapeutic methods can we employ? Obviously only those which are simple and rapid; surgical methods for preference—extraction, luxation, immediate rotation and surgical straightening.

There are several varieties of surgical straightening. Following the technic developed by Fauchard, and later by Siffre, and dealing with the maxillary incisors only, the tooth is seized at the level of the neck with forceps, the jaws of which are covered with rubber and then displaced toward its normal position by a gentle, persistent and continuous effort. Talbot, and later Pont, have described another form of surgical straightening which is less rapid.

Luxation is also a fairly old process, and was first introduced by George Cunningham of Cambridge. Having separated the alveolus by means of a circular saw on either side of the tooth to be moved, the operator seizes the tooth itself in the jaws of the forceps or in Bryan's special pincers and moves it in the desired direction. Consolidation takes place in about a fortnight.

Immediate rotation was employed to a great extent by Magitot; it consists in turning the tooth on its longitudinal axis to the degree necessary to bring it into proper position. This is done by means of forceps lined with rubber and must be done very slowly, without any brusque movement, and softly. It is necessary to go slightly beyond the normal position to allow the tooth to come back by itself in a day or two to the normal. Friteau tells us that Tomes thinks it better to carry out the operation in two stages with an interval of a fortnight between. I have not been able to verify this citation, but I do not see what advantage is to be gained from such a procedure. Consolidation takes two or three weeks.

It is not proposed to set forth in detail the advantages and disadvantages of these surgical methods, but it seems desirable at least to emphasize the great danger caused by them to the vascular-nervous system of the tooth. This objection by itself has always prevented me from trying these methods, which seem to cause excessive risk to the vitality of the tooth.

There remain extraction and the employment of very simple expansion apparatus. From the point of view of extraction, deciduous teeth and permanent teeth must be dealt with separately.

There is first of all the extraction of deciduous teeth to facilitate the eruption of the permanent teeth. This is based on the measurement of the teeth of each denture and the apparent equality of the dental arches formed by the ten anterior teeth. This method, described by authors at the beginning of the last century, does not take into account the forward movement which normally displaces the first permanent molars, and has a natural repercussion

on the deciduous denture, and must therefore be condemned. One should do everything possible to conserve all the teeth until the permanent teeth have all come down. For the permanent teeth, Guilford has indicated certain rules which ought to govern extractions, and we have shown in our *Technique Orthodontique* how limited are the indications of the extractions of the permanent teeth. In 1920 we analyzed in the *Province Dentaire* an article by Kronfeld of Vienna, and another by Dewey, both of which dealt with the indications and contraindications of extractions. Kronfeld admits the desirability of extracting certain teeth when it will facilitate treatment, or when the social position of the patient does not permit a treatment of considerable duration. Dewey holds, on the other hand, that extractions are only admissible in cases of bimaxillary protrusion described by Case, and says at the same time that he has never met a single case of this kind in all his vast practice. Personally, I have seen two or more in a single year.

Probably all the rules which one could draw up are subject to exceptions, and I should like to repeat what I said in the report I made together with Pont in 1926 to the Association Française pour l'Avancement des Sciences, namely, that extractions are legitimate in cases of bimaxillary protrusion, in cases where the patient cannot submit to a long treatment, and sometimes in the case of deciduous teeth, where the eruption of a permanent tooth is too much delayed.

Ought one to be so categorical as Guilford and forbid in every case the extraction of the six maxillary anterior teeth? In principle I think that is desirable, but on the other hand I have effected a considerable improvement in the case of a young girl, by the extraction of the two lateral maxillary incisors, which were lingually inclined, when the canines and centrals were in contact. On the other hand, I think the canines should be considered sacred. In the mandible one could sometimes permit the extraction of an incisor but never a canine. In regard to the multicusped teeth in general, it is the premolar which should be extracted, for reasons which have already been given elsewhere.

The systematic extraction of first maxillary molars is blameworthy; they ought never to be sacrificed, except when there is deep caries with infection of the pulp. Experience shows that in the majority of cases the extraction of these teeth does little or no good.

Finally, there is the question of expansion appliances. Here I shall be quite brief. The simplest are the best, and I recommend that you use those which you are accustomed to deal with, and which give you good results in private practice, but do not forget that dispensary patients have neither time nor means to follow a long and complicated treatment.

CONCLUSIONS

I have already, I am afraid, taken up too much of your time, and I cannot develop my conclusions in the way I should desire. However, I should like to insist on the following points, which seem worthy of attention:

(1) Dispensary and clinic patients have the same rights to orthodontic treatment as private patients.

(2) These rights are subject to restrictions due to the way in which the dispensaries are run, to the patients themselves, and often to the practitioners who work there.

(3) In these circumstances treatment should be limited to easy cases.

(4) In most cases one should be content with a judicious extraction after a careful study of the case.

(5) On account of the dangers caused to the pulp, one should avoid luxation, surgical straightening, and immediate rotation.

(6) When the opportunity occurs, an expansion apparatus may be employed, but it should be as simple as possible.

GROWTH OF THE BONES OF THE FACE*

By S. Wilson Charles, L.D.S., R.C.S., England

I PROPOSE in this paper to review some of the work which I have done on the growth of the bones of the face during the last seven years.

At the commencement of this investigation I was concerned with the subject from the prosthetic point of view. I had been impressed by a paper which Prentiss of Iowa University had published in the *Dental Cosmos* in 1918, in which he discussed the result of extraction of all the teeth upon the *nonvascular* fibrocartilage of the temporomandibular joint. It was obvious that if this tissue was nonvascular it would have no power of recuperation if once damaged, but it was not obvious how it could have been nourished during development and growth if nonvascular. This point was decided at once by the preparation of sections of joints from animals and men, and it was found that the fibrocartilage was definitely vascular. This observation therefore tended to negative the work which Prentiss had done on the temporomandibular joint. The same sections showed that the surfaces of the condyle of the mandible and the temporal bone concerned in the joint were not covered with hyaline cartilage as the textbooks asserted, but that they were covered by fibrous tissue. This fact had been pointed out by Hertwig many years before but, like many other true observations, had been neglected. This fibrous tissue is specialized in that it is much thicker than the fibrous tissue which covers the rest of the bone. In young subjects this is very marked and on the condyle surface is distinguished by the extraordinary arrangement of blood vessels which run deeply into the underlying layers.

It is necessary, before dealing with the significance of these blood vessels, to discuss the development of bone and particularly that of the mandible. There is still an acute difference of opinion about the development of bone, which is probably due to the fact that some bones are preformed in cartilage while others are formed directly in membrane. It has been customary to assume of late years that there is no difference between these two kinds of bone because both methods form bone, and while this is undoubtedly true, it still remains obvious that there is a great difference in development between bone preformed in cartilage and bone formed directly in membrane or in some abnormal situation such as the tonsil, a newgrowth or some operation scar.

Wingate Todd did much of his work on bone growth on membrane bones, particularly the jaw, while Witherington Stump did his work on bone preformed in cartilage. The results are entirely different to the casual reader, though when one remembers the different processes they describe, the one in many ways confirms the other. Both agree that cartilage cells, and bone cells are derived from primitive connective tissue cells. Nicholson says:

*Transactions of the British Society for the Study of Orthodontics.

"I believe that the chief and, as far as I can see, the only requirement for the production of bone is the presence of a concentrated solution of calcium salts. This acts as a stimulus to which every young fibroblast in the body is able to react.

Whatever difference of opinion there may be among observers about the methods of bone growth, they must all come back to the simple fact that the bone cell must be derived from a primitive connective tissue cell. In other words, given a fibroblast (or connective tissue cell) and the right stimulus, you get bone.

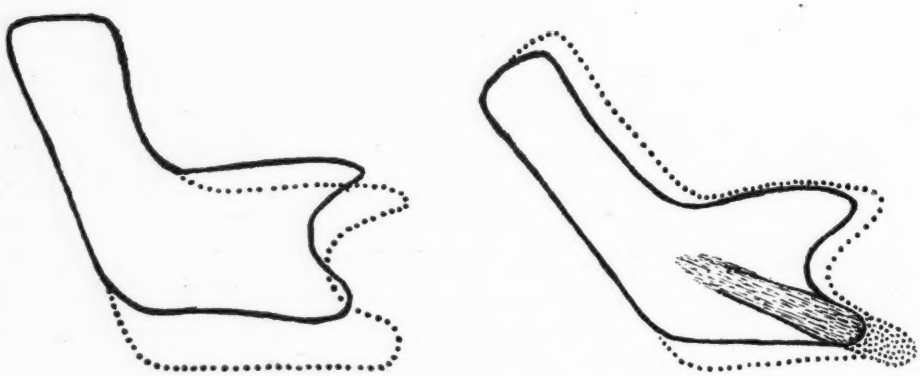
The mandible is a bone which is definitely not preformed in cartilage; and though cartilage cells are present in the developing bone they have no relation and little resemblance to the cartilage model of a cartilage bone. We do not, therefore, have to consider the replacement of a cartilage model by bone but the direct formation of bone in membrane. This may be formed in two ways from the primitive cell which I will call a fibroblast: directly by the differentiation of the fibroblast into a bone cell, or indirectly, with an intermediate stage in which the fibroblast differentiates into a cartilage cell, or chondroblast, and then into a bone cell. This latter process appears to be used chiefly when rapid growth is required. In the primitive tissue in which bone is going to be laid down to form the mandible we find an alteration in the arrangement of the fibroblasts; they begin to collect, as it were, in denser masses, forming preosseous tissue. This then becomes differentiated into bone cells. In certain situations, however, the intermediate chondroblast stage arises; always at the condyle and often at the coronoid process. Chondroblasts may nearly always be seen in the neighborhood of the coronoid process, but they never take up the same regular formation, which is absolutely constant at the condyle. It is quite frequent to find scattered cells at different parts of the bone.

The ossification of the mandible commences at a very early stage, about 19 or 20 mm., and is solely in membrane. Later, at the 50 or 55 mm. stage, an alteration takes place at the distal extremity of the mandible. The simple differentiation from fibroblast to bone cell changes to fibroblast, chondroblast and then bone. Fawcett, in his description of the development of the mandible, says that at the 55 mm. stage a strip of cartilage appears at the distal end of the mandible, which is replaced by the advancing bone of the body of the mandible.

This is quite incorrect. The apparent wedge of cartilage is in reality a wedge of bone which has been formed with an intermediate chondroblast stage in contradistinction to the simple fibroblast bone differentiation of the rest of the mandible. There is a sharp line of demarcation between the two areas of bone, which is very marked in cleared specimens. The wedge of bone formed with the intermediate chondroblast stage forms the condyle of the mandible, and it was the definite and distinctive appearance of this wedge or cone of bone which led me to the conclusions which I published in a paper in 1925: "The Temporo-Mandibular Joint and Its Influence on the Growth of the Mandible."

Prior to the publication of this paper the growth of the mandible was described as taking place by the deposition of bone at the posterior border and the absorption of bone in front of the condyle and coronoid process (Fig. 1 A). This was the view which was originated by Hunter as the result of the superimposition of mandibles, the ring experiments, and experiments with madder feeding. The correctness of this view was later confirmed apparently by Kölliker and others. Brash, in his Dental Board lecture, agreed with this view, and it was therefore with a certain amount of trepidation that I suggested in 1925 that this view was absolutely incorrect. While I was convinced that the old view of mandibular growth was untenable, it was a great satisfaction when Professor Brash confirmed my general findings in a paper read before this Society in 1926, in which he stated that we were in fundamental agreement about the method of growth at the condyle.

In the paper to which I have referred I stated that the mandible grew by additions to the base of the wedge or cone of chondroblast bone which appears at the 55 mm. stage of fetal life, and that the growth of the angle



A B

Fig. 1.

and coronoid process was subsidiary to this main line of growth, which was in an upward, outward and backward direction, the mandible consequently travelling in a downward and forward direction (Fig. 1 B). As growth proceeds the general level of the tooth sacs is raised relatively to the main line of growth of the mandible. Any obstructing bone at the base of the coronoid process is removed by the tooth sac concerned or involved in the general upward, forward and outward growth of the teeth and alveolar bone.

Before dealing with the method of growth of the mandible it is necessary to emphasize the importance of the correct orientation of the mandible or skull previous to studying it. A mandible or skull is a very different thing when considered in its correct relationship to the body to what it is when its lower border rests upon a table (the usual position in which it is examined). Many of the mistakes in prosthetic dentistry which are made by investigators are due to the incorrect orientation of the skull. It is almost natural to place a mandible so that its lower border rests on a table. It is convenient, but it is wrong.

As a result, the most remarkable conceptions have arisen, which range from the position of artificial teeth to that old fallacy, the growth of the mandibular angle in the transition from fetal to adult life. Before examining a mandible or skull it should always be placed so that the Frankfurt plane is horizontal.

If the mandible of the fetus is so placed that its lower border rests on the table, the condyle appears to be almost level with the alveolar border, and the angle does not exist. If it is correctly viewed, it is seen that a remarkable change has taken place. It is now a smaller edition of the adult mandible and not the shapeless bone it was before, when it rested upon the table. (Fig. 2 A, incorrect, B correct.) Fig. 3 shows an old edentulous mandible incorrectly placed A, and correctly placed B. The dotted outline is supposed to represent the bone lost through disuse according to some textbooks, or the part lost when the bone bends in old age according to others. The correctly oriented diagram shows that the angle is not lost and that the apparent change is due to loss of teeth. Age may, of course, produce some change in a

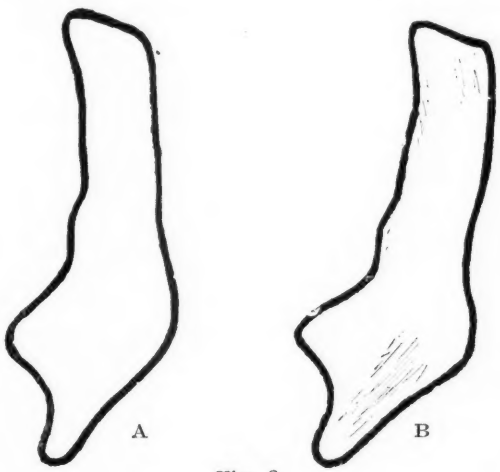


Fig. 2.

bone—it may become more delicate in outline, more translucent, but it does not change its general character or shape.

Murk Jansen, in a paper read before the European Orthodontological Society some short time ago, made the remarkable statement that "a well-known instance of the plasticity of bone was to be found in the mandible, the ascending and horizontal rami of which meet at an obtuse angle before the appearance of the teeth (and after their disappearance) and at an almost right angle when the teeth are present."

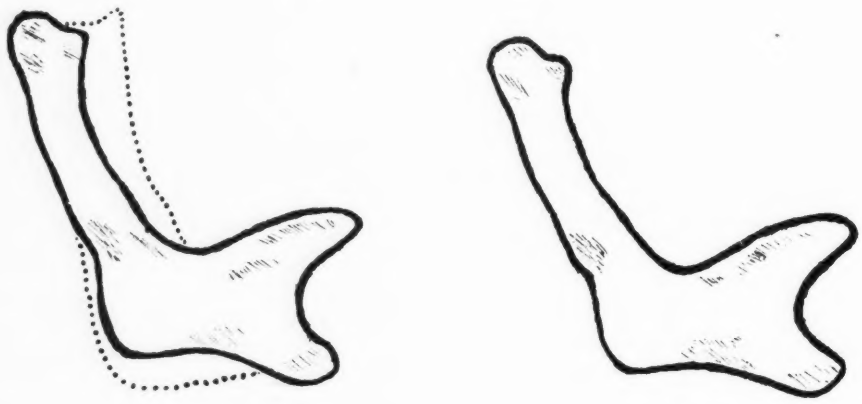
A glance at the two diagrams will show the absurdity of such an assertion as far as the mandible is concerned. The fetal, mature, and old edentulous mandibles are all the same with the exception that the teeth and alveolar bone are missing. The plasticity of bone cannot be demonstrated by the changes in the mandible.

That Dr. Kirk should make the same mistake in his paper, which he read before the British Dental Association in 1927, is not so surprising, because apart from anything else he is a believer in Wolff's law, which Murk Jansen

most certainly is not. If those who believe in the changes which they say take place about the angle thought that the supposed wasting was due to simple absorption due to lack of use or some other cause, there would not be much harm done, but the misconception gives rise, as I have pointed out, to the most remarkable theories about the bending of the bone of the ascending ramus and other similar fantasies.

The correct orientation of the mandible or skull is so important from every point of view, whether growth, prosthetics or orthodontics, that I have tried to emphasize it. The fetal mandible (Fig. 2) may be said to consist of two parts, the one consisting of the angle, ascending ramus and coronoid process and the other the portion carrying, or which will carry, the teeth. It will be found that the growth of these two portions proceeds independently. For some time growth takes place at the symphyis, and it is this growth which is responsible for the increase in width of the mandible in the early stages.

Growth in the young mandible is therefore taking place at two main points; the condyle and symphysis. The growth at the condyle is syn-



A B

Fig. 3.

chronized or correlated with the increase in width of the base of the skull, which for the present may be considered as the distance between the two glenoid fossae. As the distance between the two fossae increases, so the condyle grows upward and backward (i.e., diagonally, in the vertical plane) and outward. The growth at the symphysis controls the separation of the two angles of the mandible.

In the meantime the tooth sacs with the developing teeth have been increasing in size and have been altering their position relative to the bone generally. The anterior teeth move toward the middle line and upward, and possibly forward; the posterior teeth move upward and forward and outward. This movement is very marked, even in a mandible which lies with its lower border parallel to the horizontal plane, but the forward movement becomes infinitely more marked when the mandible is correctly placed.

Bone deposition is, of course, going on over the whole surface of the bone with areas of absorption; but this absorption is more in the nature of a shaping of the bone; not the wholesale removal of bone but a delicate smoothing

of the rough edges, so that the bone approaches more and more closely to the perfect idea. Not the heavy chipping of the sculptor trying to get a rough outline in his block of stone, but the delicate touches which perfect the almost finished masterpiece.

The study of the growth of the mandible of the rat is an interesting study in comparative anatomy. It is unfortunate from the point of view of human anatomy that the two halves of the rat's mandible do not coalesce, and that the long incisor grows from a persistent pulp. Apart from this, the growth illustrates very clearly a method of growth which is even more distinct than the method which I have described for the mandible in the young subject. In the rat there is the condyle which is the controlling factor; the angle and coronoid process are merely adjuncts to it from the growth point of view. The long incisor tooth is attached, as it were, at the anterior portion, and resting in the concavity of the tooth are the three molars. The incisor tooth of the rat is flat on the inside and round on the outside, like half-

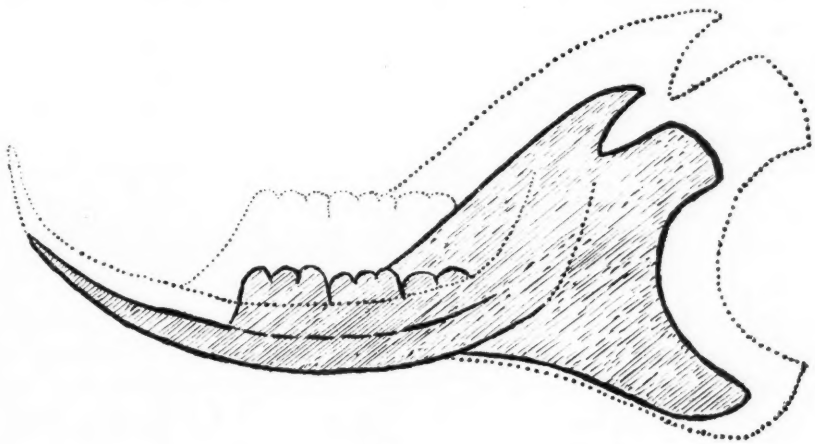


Fig. 4.

round wire, and it has a very slight but definite spiral twist, so that it is removed with a slight twist or corkscrew action.

The greater curvature of the tooth is always an arc of a circle of approximately one inch in diameter, and the inner, or lesser curvature, an arc of a small concentric circle. Growth takes place in the following manner. The condyle grows and pushes the mandible downward and forward. The center of the concavity of the incisor is at the apex of the triangle formed by the lower border of the angle portion and the anterior border of the coronoid process. The length of arc of the tooth increases, the area of the previously mentioned triangle increases, but owing to the spiral curve of the tooth the base comes to lie well outside the vertical plane made by this triangle. In the meantime the three molars have continued their very ordered way upward. A series of mandibles shows this very clearly. (Fig. 4.)

After the closure of the two halves of the human mandible the upward and very definite forward movement of the bone continues. The two ascending rami of the mandible lie in such a way that they make a definite, acute angle with the vertical. They grow upward at the condyle and coronoid

process, following the alteration of position of the glenoid fossae and the great wing of the sphenoid. Looked at from behind we see that the ascending rami are growing upward and outward, the alveolar bone and teeth growing upward and outward, and the angle tending to turn outward as it grows backward owing to the deposition of bone which is growing up to meet the condyle growth.

It is convenient at this stage to deal with the importance of this movement of the teeth. My own work in this direction confirms the results which Professor Brash published in his paper. I have in different ways (both different from Professor Brash) and at different times demonstrated this forward movement of the teeth and the alteration of the occlusal plane. I published a paper in 1922, 1923 which dealt with this question in part and from the point of view of prosthetics. Most of my work in this connection was done on skulls at the Royal College of Surgeons and dissections at Guy's Hospital. The conclusion which I came to then was that the teeth, or rather the occlusal plane, was in a constant state of flux, which altered as growth proceeded. Therefore, at any one period the occlusal plane was different from that of any preceding or succeeding period. Again, the plane would alter in two ways which would be dependent one upon the other; the level of the plane would alter in its relation to the skull, and the plane would or might alter in its relation to the plane which had immediately preceded it.

A large number of publications have appeared from time to time, especially in America, which have described methods for reproducing the movements of the mandible. Some years ago Stallard brought forward the theory of the anterior component of masticatory force, and this was seized upon with avidity. This theory was based upon the fallacy, as indeed was Dr. Wadsworth's, that the condyles remain in the fossa during depression of the teeth. In an erroneous way both of these investigators stated that teeth move forward in their sockets and travel toward the front of the mouth, and that this is due to that force which Stallard called the anterior component of masticatory force. We have seen that teeth travel forward as a result of the natural growth, and this has no relation to any muscular force. In fact, if teeth are removed, as Stallard instances, the forces which are at work upon them in the adult jaw often move them backward.

The importance of this movement from both the prosthetic and orthodontic points of view is that there is for every person an ideal imaginary surface upon which the opposing teeth meet. In prosthetics, artificial teeth articulated upon this surface (or plane) are in the correct relation to one another without any reference to the movements of the condyles. I do not agree with Dr. Wadsworth that this surface can be found in the simple way he describes. The more interesting question is that of orthodontics. Some years ago I demonstrated at a meeting of the Society a method for preparing models so that they were cut with the upper surface parallel to the Frankfurt plane. In this way one viewed a model as it actually was in the head, and in consequence one got quite a different impression. Since then I have tried to simplify this method and at the same time make it more accurate.

Of all the questions which arise in connection with the growth of the bones of the face or body generally, there is none more fascinating than the *cause* of growth. In the beginning it is of academic interest only, but later it becomes of paramount importance to all of us. Why should the mandible commence to grow at the very early age of seven weeks, and why in the great majority of cases does it grow from this tiny beginning more or less correctly?

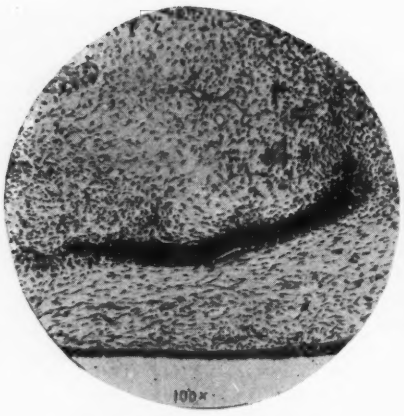
The answer to these questions is probably to be found in the world of mathematics or physics rather than in the realm of the anatomist. The existence of a time-space dimension and others of even greater complexity, is almost universally acknowledged; and the unreality of matter is a subject of ever-increasing frequency. In any case, the existence of dimensions beyond height, breadth and length is more than a possibility, even though with our comprehension of three dimensions we may not be able to grasp the existence of others, any more than an individual, comprehending only two dimensions, can grasp three dimensions, though the existence of a third may be suggested by his system of mathematics. Carried to the limit, the suggestion is that thought is the real controlling influence which plays, as it were, on the body, the brain being almost in the position of a mechanical telephone exchange. In this case vitamins, sunlight and the like sink to positions of relative insignificance.

Whatever the fundamental cause, there appears to be no real doubt that a bone grows because it has some inherent tendency to grow. External influences may affect a bone in that they may divert it from its natural course, but they do not cause it to grow. A bone tends to assume the shape and size which are natural to it, and only a gross external influence will turn it permanently from it. The majority of bones are of such an ordinary appearance that this is not striking; it is only when one considers the manifold adverse influences which might influence any bone, that one realizes the wonderful approximation to type which the great majority make.

When I breed an animal I know within a little what form that animal is going to take. I know that if I want a certain type I have to breed for it. The relation between function and form is in my opinion, a very clear one. I am of the opinion, as the result of a large number of observations and experiments on animals and observations on human beings, that form is not dependent upon function. All things being equal, a bone or muscle will assume its own size and shape in spite of the influences which are brought to bear upon it and not because of them. If the influence is too definitely severe, the relationship of things may be thrown out, but there is in the body a tendency to assume normal form whether it functions normally or no. For the well-being of the body, normal function is necessary, but this is rather because the normal body will function as it was intended to function.

I wish to breed a terrier with big bone; I do not exercise *any* dog, but I breed along the lines which I think will give me the desired result. If that dog has some trouble as a tiny puppy, such as severe worms, and is kept back and does not develop as he should, he will still retain that tendency to be big-boned. But if the dog is normal, he will want to romp and exercise; but his big bone will not be due to the functioning of his muscles.

Fig. 5.



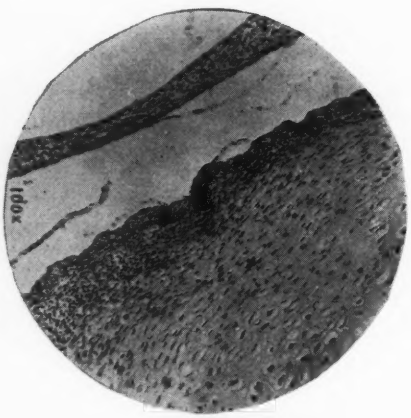


Fig. 6.

Fig. 7.

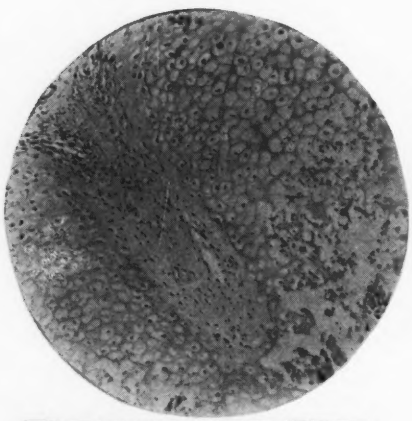


Fig. 8.

Fig. 9.

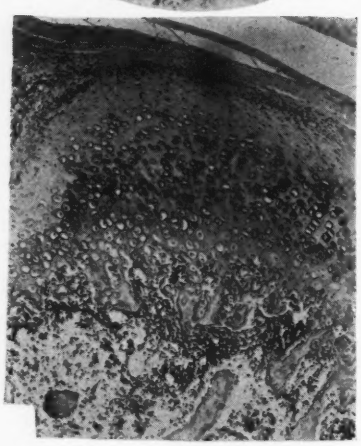


Fig. 10.

Fig. 5.—Pre-osseous tissue from a fetal maxilla. (Figs. 5 through 11 reduced by a quarter.)

Fig. 6.—Condyle showing fibrous tissue.

Fig. 7.—Condyle showing invagination blood vessels.

Fig. 8.—Section from ascending ramus, showing bone formation without an intermediate chrondroblast stage.

Fig. 9.—Condyle of child of 12 months, showing fibrous covering, layer of chondroblasts and bone.

Fig. 10.—Section taken from the anterior surface of the coronoid process showing, on the right bone deposition, and at the bottom left corner bone absorption which is caused by the developing tooth sac.

Fig. 11.—Section of fetal mandible and temporal, showing the cartilaginous bony wedge embedded in the body of the mandible.

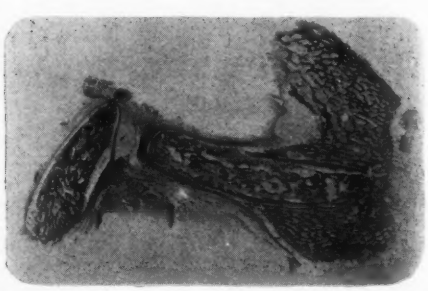


Fig. 11.

When we come to the question of the influences which may affect the growing body we must, I think, divide them into two groups. The first will consist of those nocive influences which are of so gross a nature that growth is turned out of its normal course. I do not wish to go into this question now, but I would instance such an influence as amniotic pressure (if such has a bad influence). The second will consist of those influences which we may almost call passing influences, such as perverted function due to bad habits. For example, thumb-sucking may alter the shape of the arch. If the child is normally healthy and the influence removed, these teeth will tend to assume their normal position.

I am inclined to sum up the position as follows: That, as far as the practice of orthodontia is concerned, cases may be divided into two classes (the difficulty is to separate them for diagnosis). In the one no treatment will restore normal form, though something may be done to make things more pleasing and effective. It is this class of case which tends to relapse with almost absolute certainty. On the other hand, there is the class of case which is due to some slight influence such as perverted function or habit. There is some influence which can be controlled and the teeth helped to assume a form which is normal to them, but which this influence has prevented their assuming.

A subject to which I have given a considerable amount of attention is the control of the muscles of the body. I had intended to speak at considerable length about the muscles of mastication and their control but have already exceeded my time.

A muscle is often spoken of as being overdeveloped or underdeveloped. I am not sure if it can be underdeveloped; it is probably underused; but I am quite certain that it cannot be overdeveloped, it may be overworked. Sandow, for example, was abnormal in that he had enormous muscular form; it was not due to the exercise which he devised, the exercise only keeping the muscles up to concert pitch. Think of the numbers of energetic people who have given years trying to develop knotted abdominal muscles and failed. The exercise may do them good, though Professor Pembry says that physical exercises only do one good because one thinks they do; it will not give them larger muscles than nature intended them to have.

The difficulty of exercises, either for the whole body or for any part in particular, is this: muscles are controlled in such a way that their action is more or less automatic in the natural animal, i.e., the brain does not send a message to each muscle telling it to act. If it does, then the resulting action is clumsy and jerky. The animal who acts with the rapidity of lightning is not doing it because he is the product of the pure primitive life but because his whole muscular action is automatic. When you pick up the pen to write, the brain directs the letters but the automatic control, if such a term is permissible, holds the pen in position. It is said that civilization has caused us to degenerate and lose the rapidity of action of the primitive savage. In so far as we tend to allow our brain to control our actions, we have; but the power of rapid action is still with us. For example, touch something hot. You will

remove yourself from the neighborhood of the thing which gave the unpleasant stimulus without delay and without investigating.

The muscles of mastication are undoubtedly controlled in this automatic way. The baby, having an inherent knowledge of sucking, works his jaws and tongue perfectly from the beginning. He is not concerned with anything but the fact that he can obtain the necessary nourishment. It is different when he tries to walk.

It was for this reason that I suggested the rhythmic interaction of the temporal, masseter and ptygeroids as the *modus operandi* of mandibular movements. Mr. Friel suggested that I was wrong, in his paper on "Function and Form" in the *British Dental Journal*. I had suggested, in company with others, that the hyoid muscles did not depress the mandible and were solely concerned with the tongue and swallowing. Mr. Friel suggests that they do depress the mandible. I have not discussed this question before, because I wished to give the matter further consideration, but I cannot agree with Mr. Friel.

I consider that the mandible is slung in position by the four muscles mentioned, and that it is their interaction which causes the mandible to move during mastication, speech or singing. If the command "Open the mouth" is given to any person, he may or may not open it naturally, the result may not be a coordinated action. But I am not and never have been concerned with the depression of the mandible, except in so far as it is part of mastication or speech. During both speech and mastication the tongue is actively engaged. and therefore the muscles which help to keep the hyoid bone in position and so assist the tongue (or in swallowing) cannot be depressing the mandible. They cannot be doing it for this reason (among others): no muscle can act without there being some muscle to oppose it. Allowing that the hyoid muscles depressed the mandible along with the external ptygeroid, then when the elevators of the mandible come into action these hyoid muscles must be providing the resistance. But they are fixing or assisting the tongue or even assisting in swallowing. They cannot be acting as opposites to temporal, etc., and acting on the hyoid bone at the same time. In addition, they are not placed in the correct position to exercise any great mechanical pull on the mandible. The usual picture of these muscles in the dissecting room is not the correct picture of the muscles as they would be in the living person, for in the dissecting room the head is pulled back and the throat pushed forward owing to the block upon which the neck is stretched.

I am of the opinion that the movement of depression is commenced by the external ptygeroid; that the short fibers of temporal which pass from the coronoid process to the gt. wing of the sphenoid and the short fibers of the deep head of the masseter which pass from the middle and upper part of the ramus to the zygomatic arch, act as a fulcrum. It is this action which gives rise to the peculiar movement of the mandible during depression. The path travelled is not one having a center at the condyle but a much flatter curve having a possible center much lower than the condyle. There is, of course, no fixed center, the center constantly moving its position along a curve of its own. The important point is that as the mandible is depressed, the anterior

teeth constantly move a little forward. That is what one would expect when it is considered that the external ptygeroid starts the movement of depression, the short fibers of the muscles, masseter and temporal, forming a fulcrum which is not absolutely fixed. In this way it is possible to keep up a rhythmic movement during the depression and elevation of the mandible. The tongue and the hyoid muscles are absolutely free.

All mandibular movement in man is the result of this balanced interaction of the muscle groups, and is quite independent of the condyles. It is difficult to examine because it is under ordinary circumstances unconsciously performed. When definite thought enters into it, the action becomes stilted and unnatural. This is very well illustrated by the difficulty met with in taking the bite in edentulous cases. It is for this reason that the only really satisfactory method of finding the correct bite is to place the wax or other prepared plates in the mouth, cut to the correct height and then allow the patient to gently move his mandible by himself until his muscles are tired and relaxed. The position in which the plates rest at the end of this period will be his correct bite. In passing, it may be as well to mention that this position is not of necessity the most posterior position the mandible can assume.

In conclusion, I should like to express my indebtedness to the Committee of the Medical Research Council for the Investigation of Dental Disease for the grant which has enabled me to carry out my investigations.

DISCUSSION

The President said that the author had covered a very large field, and was to be congratulated on the excellence of his specimens. He had also introduced some of the elements of orthodontics. It was difficult to discuss such a paper comprehensively, but he hoped that members would raise the points that had severally occurred to them while listening.

Mr. G. Northcroft offered his congratulations to the author. Mr. Charles's view coincided with his own on the question of form and function, and he was specially interested in that side of the paper. Mr. Charles had thrown out a valuable suggestion, touching the question of orthodontics, as to the two great divisions into which cases could be classified. He had wisely said that it was not possible to diagnose between the two, that it was only after one had failed that one learned that the case did not belong to the class which one had thought. Cases were apparently similar that were really fundamentally different, and that was why sometimes success and at other times failure resulted.

Mr. Robert Lindsay said that he did not think Mr. Charles would expect the Society to settle down to the serious discussion which such a paper deserved, and especially as the views expressed did not appear to be in harmony with those of some of the authorities on the subject of bone growth and development. But Mr. Charles had given them the opinion of some one in America to the effect that the interarticular fibrocartilage was not vascular. There must have been a good deal of investigation, anatomic and histologic, of that region by eminent men, and he would ask whether there was any indication in the works of those men that this was not a vascular area. It would be a most extraordinary thing if it were not. The capacity of the connective tissue cell to deposit bone or to do something else under differing conditions, was, as Mr. Charles had said, largely in accord with modern theories on the subject of growth. It seemed as if all that was wanted in order to produce bone was a superabundance of calcium salts in addition to certain movements of tension or pressure, when there appeared in one case cartilage, in another case bone, and in still another a different tissue. That might account for the occasional presence of bony substances in the cicatrices of wounds in tissues where bone was not usually found. He heard almost with consternation the remark that Professor Fawcett was wrong with reference to

the development of the mandible. He would suppose that Professor Fawcett knew a good deal about this subject, and looking at Mr. Charles's specimens and hearing what he said, he (Mr. Lindsay) had not noticed that there was essential difference between Professor Fawcett's view and that of Mr. Charles. He wished to ask Mr. Charles a question which he had once asked him before, without getting a satisfactory answer. Did he really suggest that the condyle grew in man after the manner of a long bone? Mr. Charles's remarks about the manner in which the mandible ought to be oriented if they were investigating absorption and deposition, particularly with reference to the posterior border, were sound and deserved careful consideration, but he did not think that what Mr. Charles had advanced would account for all that took place either there or at the anterior border of the coronoid. Mr. Charles had gone into the great question of form and function; he appeared to be sound in that respect. He said rightly that the shapes of bones were determined in the embryo long before there was anything in the nature of function.

Mr. A. T. Pitts said that he was unable to follow what might be called the metaphysics of this subject, but there were one or two smaller points with which he would like to deal. On the question of the growth of bone he would like to ask Mr. Charles whether he had read that very remarkable book by Leriche and Policard, of Strasbourg, a book which represented the fruit of many years' research. It had received singularly little notice in this country, but he noticed that a few months ago Professor Keith, in a paper he read before the Surgical Section of the Royal Society of Medicine, alluded to it in eulogistic terms, although he was not himself in entire agreement with the authors. Leriche and Policard denied to the osteoblasts the rôle of manufacturing bone, and certainly put forward many striking arguments in favor of this view. He would suggest to Mr. Charles that he would find the work well worth reading. On the point that Mr. Lindsay had raised with regard to the formation of bone in skin and other situations, the authors he had mentioned, dealt with that, and had been able to reproduce it experimentally. They also laid considerable stress on the work done on the biochemical factor present in tissues found in bone and teeth. That again was a very significant step in the knowledge of the physiology of bone growth. The only other point he wished to allude to was the point Mr. Charles had made as to the part played by the symphysis in increasing the width of the jaw. It seemed to him that the symphysis became calcified certainly within the first year. Sir Frank Coyler, in a communication he read before that Society, held it to be evident that the increase in width must have taken place after the time that the symphysis was joined, and the speaker imagined that Mr. Charles would certainly not give anything beyond the first few months after birth. Of the paper as a whole it was impossible to take it all in at a first hearing, and he would look forward with great pleasure to reading it when published.

THE DIFFERENCES IN THE CASES WITH DISTAL BITE (ANGLE CLASS II) AND THEIR TREATMENT*

By Dr. Levy-Davidsohn, Hamburg, Germany

AT THE last meeting of the Congress I had the honor of showing you the impressions and the photographs of three cases which clearly showed the differences between the diagnosis of Angle, which only takes the occlusion into consideration, and that of Simon, which is made with the help of the gnathostatics, that is with three-dimensional observation. In the discussion the last president expressed the wish to see some cases treated in our practice by this method and their results. Therefore, and in confirmation of what I showed to you last time, I want to present to you today some cases treated in my practice. In every case I have always made the diagnosis with the help of the gnathostatics. By Angle's method I should have come necessarily, as the pictures will show you later on, to a false diagnosis, so that all efforts and even the most careful treatment would have been a failure.

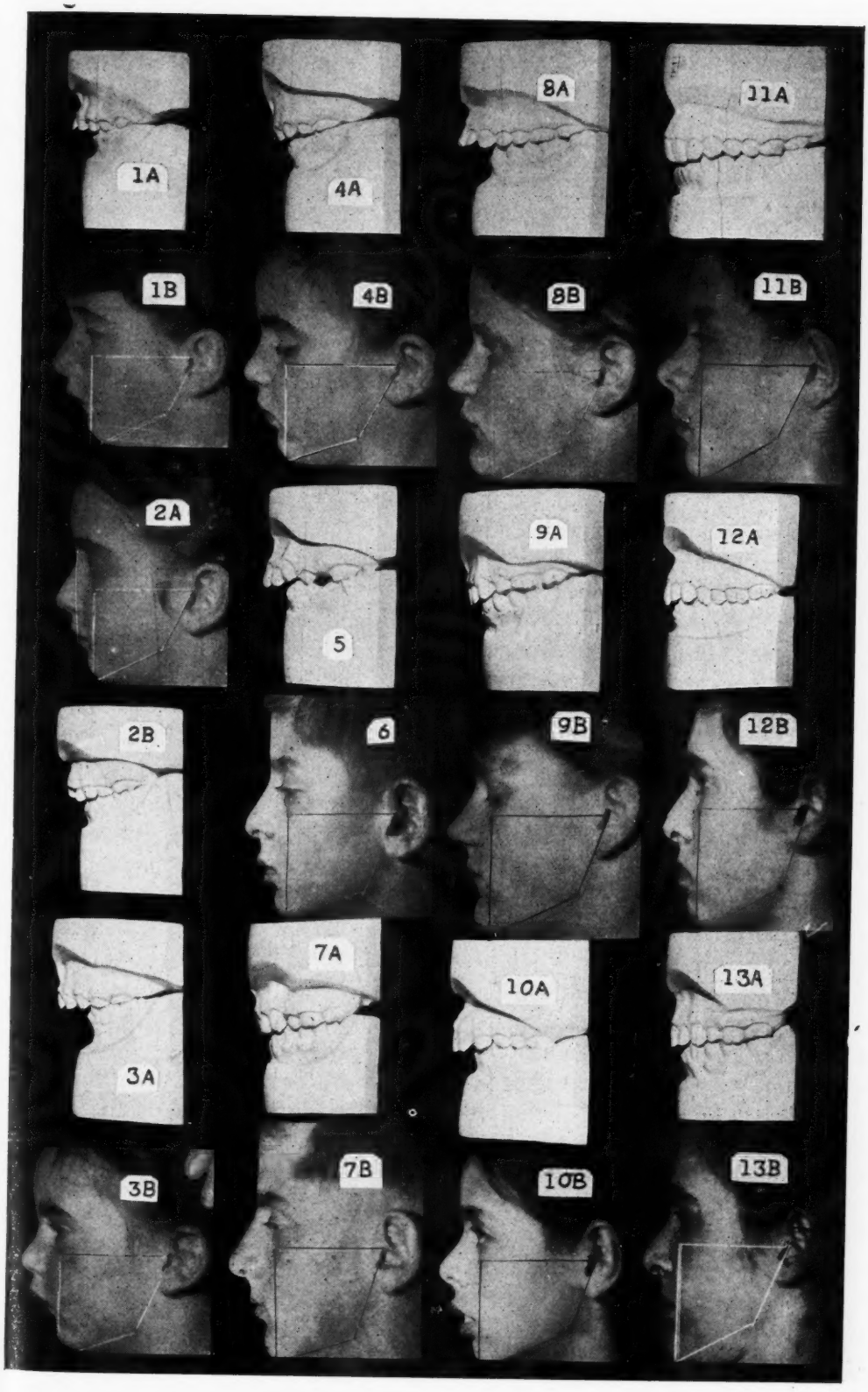
Case 1.—(Fig. 1.) Vera J., four years of age. The examination of the gnathostatic model and the photostatic photograph showed that there was a contraction of both jaws. The maxilla is normal, as the orbital line shows, but the mandible is retracted in its totality; it has fallen back in consequence of the upper contraction. The parents came rather early with their child for orthodontic treatment, but there was an imperative motive, for the child was not able to masticate at all. At the age of four years it still had to be nourished like a suckling baby with pappy food, which it only swallowed. The child had been dragged from one doctor to the other; it had been kept for many weeks in a clinic for children where it might be brought to overcome its laziness by hunger. An intelligent dentist at last had the idea that the laziness in masticating must depend upon other causes; he called the attention of the parents to the marked anomaly of the jaws, and he made them bring the child for orthodontic treatment. The difficulty of this treatment consisted, first, in getting this extremely nervous child to allow herself to be treated; but after having overcome this stage, the treatment progressed very well. The little patient only wore an apparatus for expansion in the maxilla very soon after having begun the treatment. I also made her do the muscle exercises of Rogers, with which I have very often had good success. After a short time the child was able to bite hard food, at first chocolate and apple. Of course she still had a lot of trouble, until she could masticate in the right way because she had really to learn from the beginning, but today she is nourished like any other child. The whole treatment lasted about one year. Perhaps it will be necessary afterward to expand a little, as the child seems to get very large permanent teeth. Unfortunately I neglected to take an impression at the time the treatment was finished; an impression which was taken only recently shows the present condi-

*Paper read before the European Orthodontological Society.

tion (Fig. 2). I think you will also notice the great improvement in the facial lines of the little patient.

CASE II.—(Fig. 3.) Helga Z., four and one-half years old, shows a very similar case. With this patient also, both the jaws were contracted, the orbital line was intersecting the cusps of the maxillary canines, which means that the maxilla was normal, while the mandible was retracted in its totality. The treatment consisted in essentials in an apparatus for expansion in the maxilla and daily muscle exercises according to Rogers' method. As in this case there had not been so many obstructions to be overcome, the treatment progressed quicker and lasted only about nine months. An impression, which was only recently taken, shows the present condition (Fig. 4). Recently I have had occasion to treat these rather extreme cases of anomalies of children between 4 and 6 years of age. In these two cases which I have just shown to you the distal bite really depends upon a distal dislocation of the mandible, so that Angle's injunction to move the mandible forward is justified. But now I want to show you some other cases of distal bite.

CASE III.—(Fig. 5. Gnathos only.) Werner P. This case is very remarkable for several reasons which I shall detail to you. To begin with the diagnosis, there was a pronounced contraction of both jaws; further, the maxilla was entirely protracted, the orbital line running through the cusps of the premolars. When the patient first came into my office, he was not yet quite two years old. As the second molars had not yet erupted at that time, I hoped to be able to move the lateral teeth of the maxilla as much distal as necessary before the eruption of the second molars. For some reason—I think the patient had been ill for a long time—he did not come back to my office until about one year later. In the meantime the second molars had erupted, and the plan of treatment which I had originally intended was no longer possible. Therefore I informed the parents that I had now to extract one tooth on each side of the maxilla. This alteration in the plan of treatment did not seem quite plausible to the parents. They were suspicious and, as I found out later on, consulted another colleague who had occupied himself very much with orthodontia and was considered an authority on this subject. The colleague behaved very tactfully, he said to the parents that they were in the best hands they could be and sent them back to me. But afterward he rang me up and asked me in a very friendly way for what particular reason I wanted to extract in this case, the most evident characteristic of the patient, he told me, was the extremely pronounced distal dislocation of the mandible! I must confess that I was rather amazed at this opinion, for it came from a colleague with great experience in orthodontia cases. But if one only casts a glance at the photostatic photo of the patient (Fig. 6), one really can no longer maintain this opinion. It shows that the mandible is absolutely normal! As you will see in the photograph the gnathion is lying directly on the orbital line, that means that the mandible is normal; while the maxilla is strongly protracted. You see, therefore, that the frequently mentioned "eye" of the experienced practitioner alone is not sufficient, but that it needs scientific and objecitve methods to be able to make a right diagnosis in each case. Therefore, after having once more studied the photostatic photograph of this patient


1A
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I was no longer uncertain in my plan of treatment. I had the first premolars on both sides of the maxilla extracted, moved the canines distally, and afterward pressed the front in. At the same time the maxilla was expanded as much as it was still necessary, and the mandible was shaped to correspond to it.

The next photograph shows you the result which was obtained (Fig. 7). If I had treated this case as Angle prescribes for his Class II distal bite, by moving the mandible forward, I am absolutely sure it would have been a terrible failure. The mandible would have relapsed, even if retained for a very long time, for a normal jaw does not allow itself to be forced. This case would be counted to the failures—the cause of which one is not able to explain—and where one knows oneself free from reproach, as the treatment has been executed absolutely *lege artis*. The mistake depends only upon the erroneous diagnosis. But this case is not a single one; such kinds of anomalies, more or less pronounced, belong to the daily occurrence of an orthodontic practice. The next photograph shows you a very similar case (Fig. 8). This patient was sixteen years old when she came under my treatment, so that a distal movement of the lateral teeth was no longer in question. The maxilla was entirely protracted, as you will see by the orbital line intersecting the cusps of the first premolars. The mandible, however, is absolutely normal. The gnathion lies directly on the orbital line. Therefore also in this case I had the first premolars on both sides of the maxilla extracted, and the treatment was in essential the same as in the last case. The result is shown in Fig. 9. I am also absolutely sure that this case would have been a failure treated according to Angle's rule, to bring the mandible forward, concerning the permanent result as well as the features of the patient.

Finally, I want to show you one case (Fig. 10) where both the jaws showed deviations from the normal in sagittal relation. From the close examination of the gnathostatic impression, the photostatic photograph, and the curves, it followed that there was a very strong contraction in both jaws. Further, the maxilla was protracted in its totality, while the mandible was retracted, the orbital line intersected the distal edge of the canine, the gnathion lay a little behind the orbital line. When this patient came under my treatment, she was about twelve years old, but, as the second molars had not yet erupted, I moved all the lateral teeth of the maxilla distally, and the mandible was brought forward as much as was necessary. As to the other stages of the treatment, the deep bite had to be corrected, that is the maxillary and the mandibular front teeth had to be shortened. I do not want to go into further details, it would lead us too far. I only want to show you the results (Fig. 11), and I want to mention that the treatment having been finished the parents wrote me an enthusiastic letter of thanks, in which they especially laid stress upon the favorable influence on the facial lines of their daughter.

Also in this case if I had followed the injunction of Angle to move the mandible forward, it would have been a failure, a so-called "bimaxillary protrusion" would have been the result, an anomaly which is very deforming from a cosmetic point of view, but which is very often seen as the result of orthodontic treatment. This sort of "success" has come rather often into my consulting room, as the parents were terrified about the features of their chil-

dren after the treatment. Of course it is then much more difficult to correct these anomalies than if nothing has been done before at all. I only want to show you one example (Fig. 12). This girl was nearly sixteen years old when she came into my office. She had been treated for many years, with the result you see in the picture. The features of the young girl were so distorted that the parents and the girl herself, in spite of her long treatment before, insisted upon a new treatment in order to change her features. The most conspicuous part of her face was the lower lip, which seemed to be drawn forward by force and which gave her a morose look. I had not seen the case before, but I judged it to have been a distal bite, where the maxilla had been too much forward while the mandible had been in order. As the rightly placed mandible had been brought forward by force, we had this terrible result. The case, as you see it here, represented a pronounced anomaly, a so-called bimaxillary protrusion. There was nothing else to be done but to extract the first premolars of both jaws, to move the canines distally and press the front in. You see the result in Fig. 13. But I am absolutely sure that this second treatment could have been entirely avoided by a correct diagnosis at the beginning.

I hope these few cases may have served as an example to show you that in practice the diagnosis "distal bite, Angle Class II" is not sufficient, that there are a great number of cases which have only the one symptom, the distal bite, in common, and are totally different otherwise and therefore need an absolutely different diagnosis and treatment. To be able to judge an anomaly, it is therefore not sufficient to take the occlusion as a single criterion, one must rather make use of more exact and scientific methods such as the gnathostatic offers us. I hope these few examples will have clearly shown the enormous progress as to diagnosis and therapy this method has brought us.

DISCUSSION

Dr. Dreyfus thought Dr. Levy-Davidsohn had pointed out all that was to be said in comparison with Angle's method.

Dr. Hipwell said the thing that had pleased him so much in the paper was the possibility of having a practical case in a child of four years of age, as dentists had been trying to tell the laity that cases commenced early. During the last years he had taken fewer cases over 12 years of age; he did not want them because he could get enough children between 5 and 7. The smaller the child the easier the work. The cases shown by the essayist would educate both the public and the dentist. Many dentists kept cases in practice until 10 or 12 years of age and then referred them to the orthodontist. He thought dental surgeons were overtreating cases with mechanical appliances. He should like to know what pathologic condition was found in the child of 4 years of age.

Dr. Levy-Davidsohn said the question of taking points other than those suggested depended on the personality. It was possible to take any line or several lines. The difference was between the old school, which took only the occlusion into consideration, and the modern school, which took three dimensional observations. She was absolutely of Dr. Hipwell's opinion that the smallest child was the easiest, and she had now had a very great experience with children of the younger ages. It was not easy to obtain young children for treatment, but it was wonderful the great success that could be obtained and the pleasure given to the parents. With regard to overtreatment by mechanical appliances, she could not quite agree, because she found it was really imperative to treat the children in that way, as otherwise they could not be helped.

ANTHROPOLOGIC AND ODONTOLOGIC STUDIES OF TWINS*

By Dr. G. Korkhaus, Bonn, Germany

HUMAN research depended until recently almost exclusively on family-pathologic research. In applying this to the marks of distinction and the irregularities of the denture and cavity of the mouth, however, special difficulties arise owing to the development and the perishable nature of the denture. To ascertain the marks of distinction of the denture of more than two generations is nearly an impossibility, as the youngest representative is still the possessor of deciduous teeth when the teeth of the grandfather have long been the victims of caries. These difficulties give a plausible explanation for the fact that the hereditary pathologic questions of the mouth are far from cleared up yet, and that the assertions made in this respect are without sufficient proof. Fortunately, nature offers us an easier way to enter into the secrets of heredity as far as it concerns our special sphere of research, namely, by the examination of so-called identical twins, who form one-fourth to one-third of all pairs of twins. Here we have two individuals in total or nearly total conformity regarding their entire origin and their heredity, so that all differences found could be considered paratypical. The systematic examination of a great number of such identical twins gives, therefore, the possibility of separating inherited qualities from acquired ones and of ascertaining the actual idiotypical base of distinctive marks, a result which could not be attained so clearly by the other methods of research in human heredity. While the deviating marks of distinction are in general of a paratypical nature, the conformity of a distinct mark, on the other hand, is not equivalent to heredity, as this may be brought about by the equally strange influence of the same external factors. The question whether such common qualities are caused by idiotypical or paratypical influences will be answered—according to Siemens—by the discovery as to how often these common qualities occur in nonidentical twins as compared with identical twins. In the first case the factor could be considered paratypical, as it makes its influence felt in the identical as well as in the nonidentical twins in the same way. On the other hand, however, the idiotypical defined marks of distinction are to be expected in more frequent conformity with identical twins than with nonidentical twins in the most favorable case, i.e., in the case of dominant heredity, the accumulation of marks defined by heredity amounts to 50 per cent.

In recognition of the great significance of this modern way of researches in human heredity, I have organized in Bonn—like Siemens in Munich, and Weitz, Verschuer and Praeger in Tübingen—in conjunction with the medical policlinic in Bonn (Curtius), researches in twins for the past two years. Isolated observations of identical twins were also made by other research workers—Baker, Kelberg, Lundström—who ascertained great similarities of jaw

*Paper read before the European Orthodontological Society.

formation, and Edel, who demonstrated a specially interesting case in this respect. At this time more than 120 pairs of twins are under observation, the greater number being identical twins. It is clear that only a large number of cases will justify distinct conclusions, and I therefore beg that my demonstrations of today be taken only as a temporary summary of the material at present under observation, whereon to enlarge continuously will be our next task.

First of all, our object was to register as exactly as possible the complexity of marks, which was given to us by the identical twins, according to the example of Poll and Verschuer, with the help of anthropologic measurements, photographs and impressions. With your kind permission I will demonstrate now a few pairs of such twins (Figs. 1-4).

If you consider that the face is that part of the body which individually varies the most in its thousand and one details, then the resemblance will become especially clear to you. With the attempt to comprehend this striking resemblance more exactly, and by considering the countenances in their manifold details—in accepting the criminalistic method, the *portrait parlé* of Bertillon—the extraordinary conformity of form and size of the marks of distinction is surprising.

Totally different is the impression received from nonidentical twins, of which I will show a few examples (Figs. 5-7). Here we find a certain family resemblance, but the twins can in no way be mistaken, since they show great differences.

To a certain degree, however, small differences in resemblance can be found in identiael twins (Figs. 8 and 9). If, according to the examination of E. Fischer on the Reboboth-Bastards, the strong idiotypical condition of the form of the skull cannot be doubted, yet on the other hand far-reaching possibilities of paratypical influences exist. Owing to the limited time at my disposal, I can only deal with these subjects in a perfunctory way.

These influences can be brought about by intrauterine development, which takes place with identical twins in a considerably different way from that of nonidentical twins, owing to the different form of feeding by the monoplacenta and, furthermore, by the not rarely found deformity of the skull, caused by the twin-pregnancy, the so-called "oxycephalic" skull, which can only affect one of the twins, and which can alter to a great extent the contours of the face. They can finally be caused by a peculiar, possibly accidental, sleeping position in the first months after birth, a time when the skull is still plastic and probably very flexible owing to rickets. If also a certain variation in the shape of the skull caused by exterior influences cannot be doubted, the fact must be emphasized, on the other hand, that these possibilities of influence are practically limited, and that heredity plays proportionately the more important rôle.

It is easily understood that deformations of the brain-pan will influence the facial skull. On the other hand, the anomalies of the denture, which have been incontestably acquired, can be responsible for striking alterations of the facial skull in one of the identical twins, as we have observed on different occasions.

Figs. 1, 2, 3 and 4.—Identical (one egg) twins.
Figs. 5 and 6.—Non-identical (biovular) twins.

In a very careful way a great number of bodily and mental marks of distinction were examined, so that the results of the anthropologic measurements gave a specially interesting hint as to the hereditary proportion of the development of the facial and brain skull. Also questions regarding heredity of form, size and color of the teeth, regarding the Carabelli tubercle, and the structure of the substance of the tooth, especially of hypoplasia, and a great number of other marks, found a final solution through this research. I must deny myself a detailed illustration in this respect and refer to a publication in preparation, which will be edited in the near future.

Today I must content myself with reporting the results of research regarding the anomalies of the jaws.

One mark of distinction, which leads to peculiarities of position of the teeth, has been already examined from the family anthropologic aspect, namely the diastema. According to Kantorowicz and Terwee, it concerns a dominant inherited mark. This opinion is also confirmed by our results: it was found four times in absolute conformity in identical twins, in nonidentical twins, however, only on a few occasions. The results of Siemens and Hunold—contradicting the above—can be explained by the insufficient limitation of the conception of diastema, and, probably, by the counting of just accidental abnormal spaces, which can be caused temporarily by the physiologic formation of spaces in the fifth and sixth year of life, or by the forward pushing pressure of the thumb in the course of thumb-sucking.

If I deal now with the actual anomalies of position of the teeth, I am approaching a subject which is extremely difficult to comprehend in its morphogenesis. A complete enumeration of the single marks of distinction and a comparison with the respective proportion of nonidentical twins is only possible in the most rare cases, owing to the complicated matter of fact. Here a careful analysis has to take place, and this with regard to each jaw in its details and in its cooperation with the opposite jaw, and this is only possible when an impression of the jaw is taken. Praeger repeatedly acknowledges this necessity, and it is therefore the more to be regretted that it was not possible for him to take impressions of his twins. Only then, when one succeeds in enumerating with the analysis of the denture the distinct acquired anomalies, in details, can the proportion of heredity in the origin of the deformities of the jaw be finally ascertained. Distinct hints for a hereditary fixing can only be obtained for prognathism of the mandible which is not present at birth, but—as proved by other examinations—caused by a too strong growth of the mandible during the first year of life, and furthermore for excessive overbite. For both anomalies the same finding was established in every two cases. The same state of things had also been confirmed by family researches and is after all in corformity with our expectations, as we have not succeeded up till now in finding an exterior chain of causes for these anomalies.

The jaws of every pair of twins were searchingly analyzed. I shall demonstrate some jaws of identical twins, from which I will draw attention to some interesting facts.

Fig. 10 shows jaws of identical twins, six years of age, with a complete normal deciduous denture. Exact identical width and height of palate. The

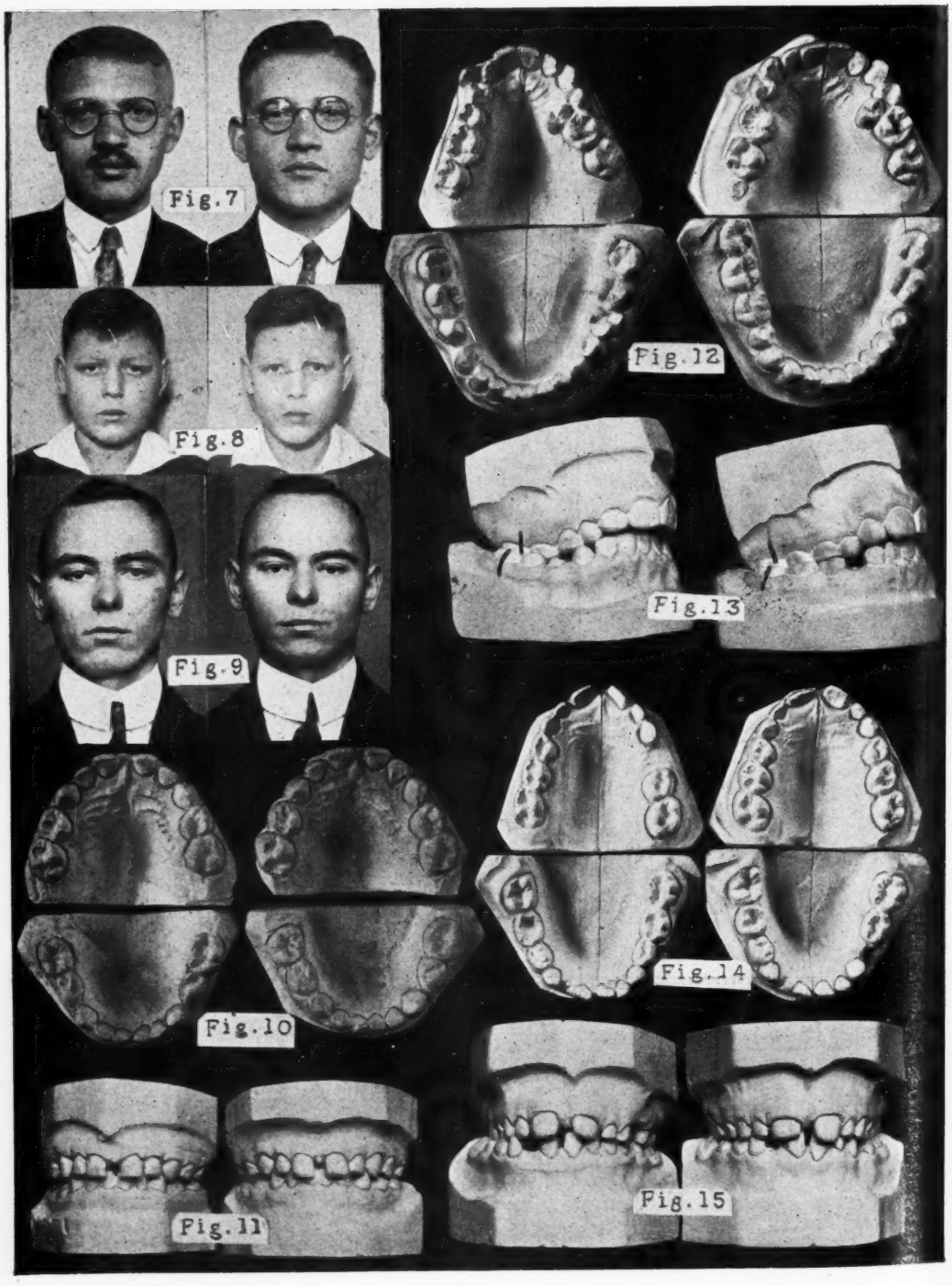


Fig. 7.—Non-identical twins.
Figs. 8 and 9.—Identical twins with difference in the height of the face.
Figs. 10 and 11.—Identical twins, six years old.
Figs. 12 and 13.—Identical twins.
Fig. 14.—One egg twins, seven years old.
Fig. 15.—One egg twins.

same diastema, the broad papilla incisiva passes through the space to the frenulum of the lip. In occlusion this case shows also a striking resemblance in all details (Fig. 11).

Fig. 12 shows the jaws of a twenty-five-year-old pair of twins, which apart from a different strong compression, which probably is caused by a different intensive influence of disturbed nasal breathing, they show a striking conformity regarding a special mark of distinction, namely, that one finds with both a palatal eruption of the left second premolar with an exactly similar rotation and the same influence of the adjoining teeth. This great conformity is not the expression of a hereditary necessity, as we know the genesis of such an anomaly of position. It is brought about by the premature loss of the second deciduous molar, the duty of which is to keep the place for the permanent tooth. With both twins the space was completely closed by the adjoining teeth, and the second premolars had to erupt in a similar way toward the palate. On the left side exactly corresponding conditions prevailed with one of the twins. The dislodged premolar was extracted a short while before. With the other one of the twins the second—probably in consequence of a somewhat earlier eruption—could still attain its place, whereby the canine was compelled to erupt in the wrong place. On the left you have therefore the same paratypical factors (premature loss of a deciduous tooth), showing here, owing to a totally accidental difference in the course of development, a somewhat different result.

Fig. 13 shows a similar effect of compressing forces, probably caused in early infancy by the influence of bottle-sucking on a bone weakened by rickets. The jaws are quite evenly compressed, and corresponding to this we find the same protrusion of the maxilla over the mandible. We had the opportunity of observing the origin of such anomalies caused by purely exterior factors in many cases during infancy. Such anomalies were also found in the most different shapes and forms. The conformity speaks, therefore, only for the same reaction of the idiotypical form of the jaws to the same effects of external factors, i.e., for the same idiodisposition, and not for the hereditary necessity of the anomaly of the jaw. In occlusion, there is a striking resemblance of the protrusion of the maxillary incisors and the occlusion of the molars.

Figs. 14 and 15 show similar conditions with a seven-year-old pair of identical twins. The same compressing energies, the same expressed diastema, the same turn of the central incisors, which are in course of eruption. I wish to draw attention to the simultaneous eruption of the lateral incisor on the lower right and the same rotation of the erupting mandibular incisors.

Also the occlusion shows the same condition, so that it is difficult to differentiate between the two.

Fig. 16 shows denture of a pair of twins, thirty-four years of age, with complete conformity in regard to form of teeth and details of the palate with the one exception of the difference in width of the back of the maxilla and mandible. As for the origin of jaw deformations in general, only exterior factors play a rôle and exert their influence during the time of growth; and as these differences are in a place which has developed at a time when the jaws are pretty well set and are capable of resistance, and furthermore as in this

Fig. 16.—Identical twins, thirty-four years old.
Figs. 17 and 18.—Identical one egg twins with mandibular prognathism.
Fig. 19.—Striking resemblance of excessive overbite with identical twins.
Fig. 20.—Quadruplets, ten months old.
Figs. 21 and 22.—Non-identical twins.

case the front part of both jaws shows a striking conformity, here only an indirect effect of paratypical factors on the jaws can be imagined. The anthropologic measurements shown now in the right-hand twin that the width of the face and the skull was greater, so that in consequence the greater width of the denture was only of a secondary nature, and probably caused by the greater width of the skull. The differences of the form of the skulls must be traced back to influences—not possible to ascertain at present—but probably caused by a certain sleeping position.

Figs. 17 and 18 show the case of a twelve-year-old pair of identical twins with lower prognathism without the maxilla being concerned in the anomaly. The incorrect occlusion represents only an anomaly in its development but looks extremely ugly after the completion of development. Researches in the family in this case confirmed the suspicion of an idiotypical fixation. The wide examinations of Haecker and Kantorowicz regarding the advanced lower lip of the Hapsburgs have already illustrated the possibilities of such a connection; only scientific proof is lacking, as it was not possible to control the values of the countenances from the existing paintings, medals, etc., with the analysis of the respective jaw. With the help of researches on twins it will now be possible to bring proof for the hereditary necessity of prognathism.

Fig. 19, in a similar way shows by the concordant occurrence of an anomaly, seldom found, that this deformity is inherited. It concerns—as you can observe—an excessive overbite present in both twins in absolutely the same way.

Case quadruplets (Fig. 20). In conclusion, I take the liberty of demonstrating to you the models of some impressions rarely seen. They originate from quadruplets, ten months old, with whom—probably by the preference of the same one-sided sleeping position—an identical flattening of the back of the skull took place. Strangely, the jaws showed the same dints of the frontal arch to the right, probably caused by the same manner of thumb-sucking, which was confirmed by the nurse.

With the object of comparing the findings of identical twins with those of nonidentical twins (two-egg twins), I wish to demonstrate a few jaws of nonidentical twins which will show a totally different picture.

Fig. 21 and Fig. 22 show different form and size of teeth, totally different kind of form and wrinkles of the palate, different occlusion. It is impossible to find any inner connection between the jaws. With the twins on the left, no Carabelli tubercle, in the right one, however, a pronounced tubercle.

Pathologic researches in the cavity of the mouth in twins are only in their infancy. They are, however, qualified to bring a final solution regarding the problem of the heredity features in the mouth. My request to you is, therefore, to participate in this task by the eager collection of twin cases. Apart from the production of a good impression of the jaws, the establishment of a few important anthropologic and internal qualities will come into question and may be obtained in cooperation with the house physician. We are only too willing to distribute circulars which contain the necessary details to all colleagues interested in this research.

A FEW SYMPTOMS OF THE IMPACTION OF PERMANENT CANINES*

By Dr. James T. Quintero, Lyons, France
Professor of Orthodontics, École Dentaire de Lyon

THE symptoms of the impaction of canines may be classified in two ways, either from the method of their perception, or from the localization of their manifestation. In the first instance, one speaks of the symptoms perceived by visual inspection, touch, or radiography, as the case may be. In the second, one considers the symptoms either local or proximate, according as they have their seat at the place normally occupied by the canine or more or less in its vicinity.

(1) *The local symptoms* are well known generally, and it is not necessary to recall that they simply consist of the fact that the permanent canine is absent, with or without retention of the deciduous canine.

(2) *The proximate symptoms* differ slightly in detail, according as the canine is in labial or lingual impaction; they may be divided into direct or indirect proximate symptoms, according as they directly concern the canine, or as they concern other teeth which are influenced by the impacted tooth.

A. *Direct proximate symptoms.*—One of the direct proximate symptoms may be perceived by palpation and often by simple inspection, namely (see Fig. 1), the tumefaction caused on the labial or the palatal aspect by the impacted tooth. The tumefaction is round, hard, painless, and of no particular coloration; on the labial side it whitens under finger pressure, whilst when palatal it can be slightly depressed.

Another direct proximate symptom is evidenced by radiography (Fig. 2), a method which should always be made use of in these cases, although its importance should not be exaggerated, it is only to be used to confirm the clinical diagnosis. One should not expect a radiogram, however excellent it be, to show whether the impacted tooth is on the lingual side of the arch, or on the labial side. It is precisely in this conjunction that it is useful to have some knowledge of the proximal lesions due to the presence of the impacted canine.

B. *Indirect proximate symptoms.*—As stated above, these symptoms differ according to the direction in which the impaction of the tooth takes place. They generally manifest themselves upon the lateral incisor only, but sometimes, in extreme cases, their influence is exerted even to the central tooth on the side on which the anomaly occurs; we have never observed their effects to reach as far as the other side, even in a case (Fig. 3) in which the point of the canine extended beyond the median line.

These effects can easily be analyzed by viewing in succession the various parts of the lateral with which the canine may come into contact. This will

*Paper read before the European Orthodontological Society.

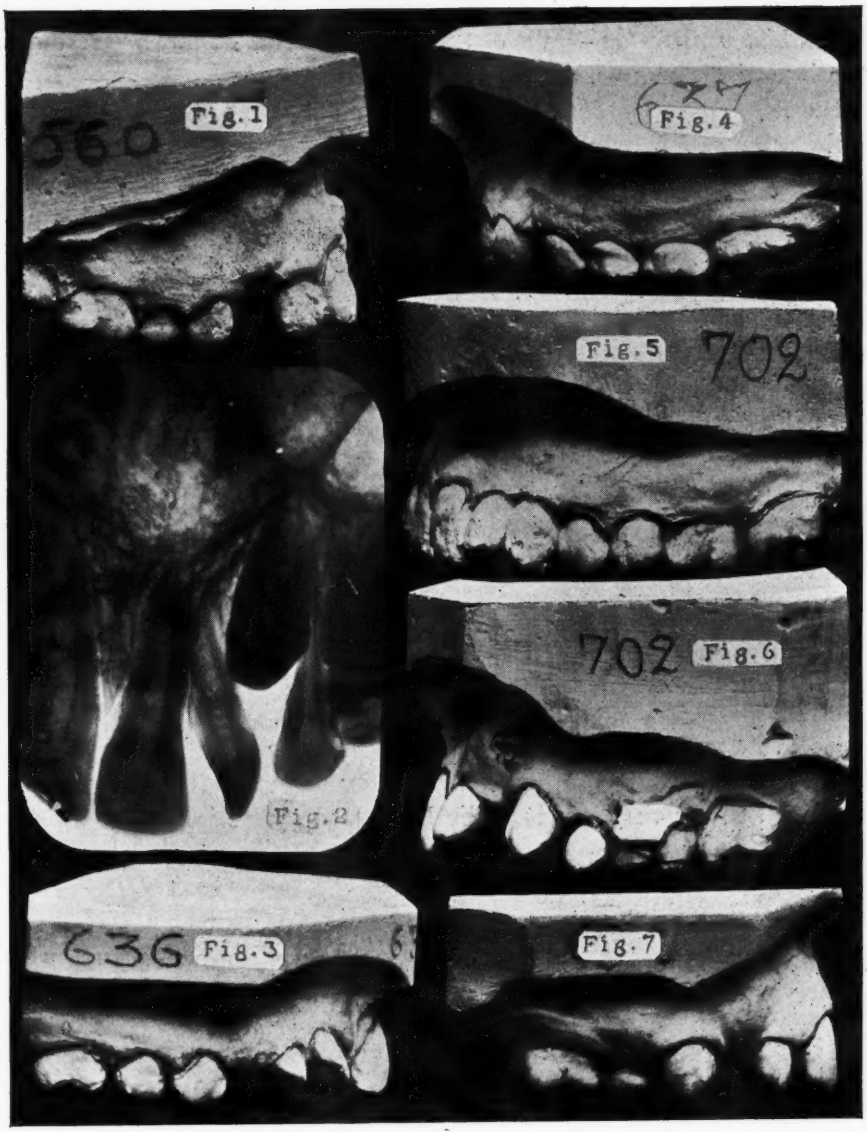


Fig. 1.—Tumefaction of the gums caused by the impaction of the tooth on the labial side of the arch.

Fig. 2.—Radiogram of an impacted tooth, showing (1) the rotation of the lateral, (2) the persistence of the deciduous canine.

Fig. 3.—Labial impaction of the right canine, the point of which extended beyond the median line; note the rotation at an angle of 30° of the two incisor teeth.

Fig. 4.—Palatal impaction of the left canine, with retention of the deciduous canine. The diagnosis was made possible by the rotation of the lateral, and was confirmed by radiograms.

Fig. 5.—Retention of a deciduous canine in the case of a girl seventeen years old. Labial inclination of the lateral.

Fig. 6.—The same case after treatment for one year: extraction of the deciduous canine, elastic traction on the impacted canine by means of a hook barely visible on the labial aspect high up. The tip of the cuspid almost reaches the neck of the lateral; the inclination of this latter has increased by reason of the increased pressure of the canine.

Fig. 7.—Impaction of a canine toward the labial side of the arch; rotation and lingual displacement of the lateral.

often allow the seat of the impacted tooth to be determined. Two kinds of cases may occur:

The tooth may be labial or in palatal impaction.

(*a*) *Labial Impaction.*—When the canine is in labial impaction it may cross the lateral either near the apex or near the neck.

In the first case it produces an inclination of the tooth: a lingual inclination of the apex and a labial inclination of the crown (Fig. 4).

In the second case, as the pressure of the canine is exerted nearer the neck, almost the entire root acts as a resistance, and a double inclination of the lateral is rather rarely observed (Figs. 5, 6), but there may be a lingual displacement, or only a rotation (Fig. 7). This latter anomaly occurs when the canine crosses the lateral bodily, and, when this is extremely pronounced, it is possible to have a rotation not only of the lateral but also of the central. The rotation then is generally distolabial or mesiolingual (see Fig. 3).

(*b*) *Lingual Impaction.*—Cases of lingual impaction of a canine are slightly less frequent. Generally the tooth has sufficient space in the arch to grow normally, and it has also less tendency to take a horizontal direction.

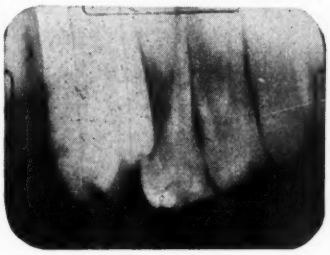
Here again it causes a rotation of the incisors which points to the presence of an impacted canine and suggests the probable diagnosis which a radiogram can confirm.

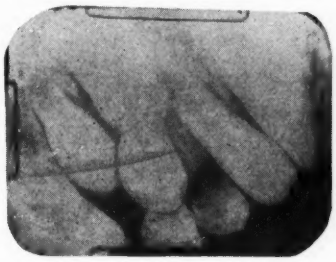
There is no occasion here for considering orthopedic methods for bringing back impacted canines to their normal position. My desire has been simply to call your attention to some of the effects of their impaction upon the neighboring teeth. I may add that in none of the treatises I have gone through have I found these points referred to, but they are of such frequent occurrence that it seemed to me they ought to be brought to your notice.

THE FIRST PERMANENT MOLAR*

By Dr. Sylvain Dreyfus, Lausanne, Switzerland

IN EXHIBITING two x-ray photographs, Dr. Dreyfus said that Dr. Angle's classification was based on the first molar, and the grounds that he gave for that were very well known, namely, (1) the first molar was the first permanent tooth, and (2) that it was developed when the others were breaking out. Angle considers those teeth as stable and fixed and *always in the right place if the deciduous teeth were not extracted or carious,* and that therefore that was the key to the occlusion. Further, Dr. William Brady said that the first maxillary molars were the only teeth developed and already situated before birth and that there was never any trouble or difficulties in their cutting. It was not a new matter, but it was necessary to point it out because the x-ray pictures which he showed manifested exactly the contrary; on each side the





second deciduous molar was in place without caries and the same applied to the other deciduous teeth, and the first molar was coming under the deciduous molar pushing it out. The case was not the first which he had seen. Generally x-ray photographs were not necessary in such cases for diagnosis, but he thought it would be interesting to publish such a case. The x-ray pictures established also that it was a mistake to base the diagnosis in relation to the teeth. The basis of a correct scientific diagnosis was to be taken from the maxillary bones, and without going into particulars he would recall the diagnostic method with the horizontal plane of Frankfort, the Simon's orbital plane and the naso-frontal plane and sagittal plane, of which he had given descriptions in former papers. At the same time he used improved methods of casting and trimming of the models in view of the diagnosis.

DISCUSSION

The President thanked the essayist for his very interesting paper and said he was personally interested because certain causations with regard to growths had been heard, and it was thought that the cause was the first molar. On the last occasion a paper was read to show the difficulty caused by the third molar. It was very interesting also to hear the definition of the diagnosis of the function.

*Paper read before the European Orthodontological Society.

Dr. S. Dreyfus mentioned a case he had had a little while before of a young lady who had been to a dentist who told her that the whole trouble was coming from the third molar and that it must be extracted, and another dentist told her the same thing. He looked at the case and considered that it was not necessary. There was pressure that crowded the teeth. It was now a year and six months that the patient had been under his treatment and had been to the first dentist for other treatment, and it was said to be all right. She had quite sufficient space for a dental floss between the second and third molars, and it was not necessary to extract it. By scientific diagnosis it could be discovered whether it was necessary to extract the molar or whether something else should be done.

Dr. d'Alise said he did not say it was always necessary to extract, and very often it happened that extraction was not needed. It was possible to prevent malocclusion, and the dentist must insist on young patients masticating sufficiently to develop the bones of the face. On one occasion he had read a paper in an Italian congress on the subject of vigorous mastication and good restoration, and before the European Orthodontological Society in Paris he had also read a paper dealing with the relation between malocclusion and development, and he had found since by many experiments and examinations of many hundred children that there was always a relation between malocclusion and the respiratory apparatus. The task of the dentist now was very important. Medical men knew nothing about dental science, and it had to be suggested to them that there was something to be learned. There were many specialists in nose, throat and ear diseases who knew nothing of dentistry, much less of orthodontics, and they did not seek the source of the illness, whereas if they had only elementary notions of dental science, they would see matters more clearly and heal their patients very quickly. In medical schools no teaching was given with regard to the pathology of the teeth.

THE DESIGN OF AUXILIARY SPRINGS TO REDUCE BREAKAGE*

By Dr. H. E. Abelson, New York, N. Y.

ONE of the most frequent sources of trouble in the application of auxiliary springs is breakage at the point where the auxiliary spring is soldered to the body wire. To eliminate such breakage the simplest and most practicable method that I tried is the one which I shall now describe.

The auxiliary spring is wrapped around the body wire once or twice, away from the soldered joint. The step-by-step process is shown in Figs. 1, 2, and 3. The reason for the breakage occurring in the common method at the joint of attachment is that the entire strain of anchorage is borne by a relatively small amount of material. Thus the strain per unit area is very

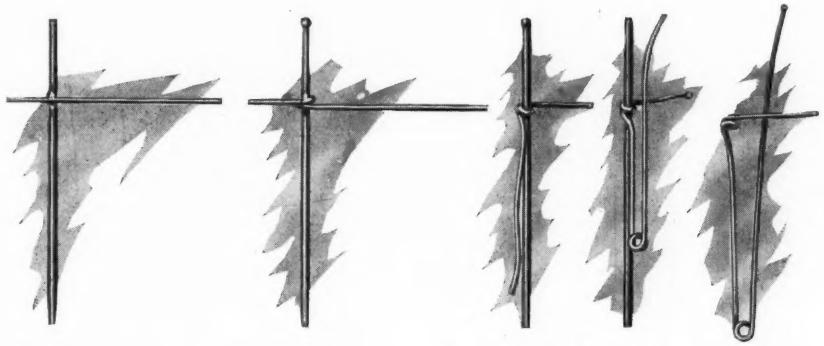


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5.

Fig. 1.—Auxiliary spring soldered to body wire at 90°.
Fig. 2.—Wrapping of auxiliary spring around body wire.
Fig. 3.—Auxiliary spring bent back at right angles to follow body wire.
Fig. 4.—Helical spring inserted at recurve.
Fig. 5.—As auxiliary spring looks when detached from body wire.

large and exceeds the strength of the material, that is at the soldered joint. It must be remembered that the joint has the strength neither of the body wire nor of the auxiliary spring, but rather a lower strength because the soldering process has changed the molecular arrangement of both wires at that joint, and the resistance to stress is that of the alloy created by the soldering process.

While an engineering treatment of the subject explaining why wrapping the auxiliary spring once or twice around the body wire would be rather complex, it is obvious from Fig. 3 that the stress exerted over the entire auxiliary spring is absorbed in the new type of attachment. As this consists of the soldered joint and the wrapped turns, the amount of material resisting the stress has been increased by a large ratio. The total stress exerted remains

*Designed at the Dewey School of Orthodontia.

the same, and, therefore, it is evident that the strain per unit area of material has been largely reduced and is kept well below the breaking point of the material.

The second point of frequent breakage has been at the recurve of the auxiliary spring. I sought for some time to revise the shape of the standard materials to reduce such failure, but with little success. It then occurred to me to make use of the principle of the helical spring at the point of recurve (Fig. 4). Thus by putting one and one-half turns in the auxiliary spring at the point of recurve, breakage has been practically eliminated.

It will no doubt be of general interest that observations on this improvement, over a period of two years, have shown that breakage has been reduced by 90 per cent. This figure may err on the conservative side. From Fig. 4 can be noted that the functioning of this improved auxiliary spring has not been altered. In fact, it has been improved, as the flexibility has increased.

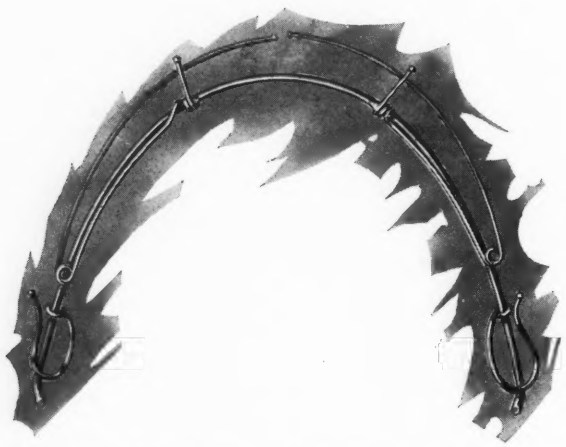


Fig. 6.—Finished appliance with auxiliary springs attached.

Another point of interest may be the reason for breakage at the point of recurve, which is known to the engineering profession as the "fatigue" of the metal. A simple example will illustrate the effect of this fatigue. It has undoubtedly been noted that a piece of steel wire can be broken, when pliers are not handy, by bending the metal back and forth at one point. The metal feels rather warm to the touch, showing that there has been a rapid readjustment of molecular alignment. Probably this action at a slower pace is what causes the break at the recurve of the auxiliary spring. By introducing the one and one-half turns of helical spring at that position we distribute the fatigue effect over a very much larger amount of metal which, for this reason, stays well below the fatigue point. The helical turns may be applied to lock springs or other forms of springs with similar improvement.

TECHNIC

The auxiliary spring is laid across the body wire at an angle of 90 degrees and soldered. It is then wrapped tightly once or twice around the body wire and bent at right angles to follow the body wire posteriorly to the pre-

molar. The helical turns in the recurve are then made. This consists of one and one-half complete turns, bringing the free end of the spring to the anterior point of the appliance.

At the point of soldered attachment an extension of about 5 mm. may be left, before wrapping, to act as a guide and protection to the free end of the recurved auxiliary spring. Thus in one operation the usual guide and the auxiliary spring are completed.

SOLDERING HOLDER*

By Dr. G. Korkhaus, Bonn, Germany

SOLDERING with fine wires has proved indispensable to modern orthodontic treatment. Following my proposal, the firm Degussa, Pforzheim (Germany) has placed a soldering holder on the market, which I have the honor to demonstrate.

Fig. 1.

Fig. 2.

The soldering material is on sale on the market in the form of little reels. The reel is fixed to one end of the holder; the soldering wire passes through the holder and is advanced with the help of two little wheels as needed.

*Transactions of European Orthodontological Society.

LINGUAL LOCK*

By Dr. Korkhaus, Bonn, Germany

WILL you kindly permit me to draw your attention to a lingual lock which I have been using very advantageously? The unlimited numbers of different lingual locks always show faults, which are caused by the position of the lock spring near the gum and by the insufficient length and stability of the lock pin.

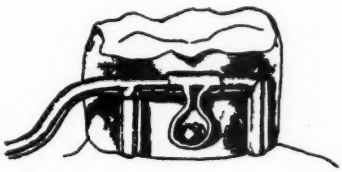


Fig. 1.

Fig. 2.

In place of the half-round tube of the Mershon lock I use two round tubes which guarantee a considerable increased stability, especially as they can extend over the whole length of the crown, as the spring lock is missing. The fixation is performed with the help of a catch, similar to the safety catch known in the jewelry trade. The handling is very simple, and for the loosening of the lock the catch is only lifted by an instrument.

This lock is constructed by the firm Degussa, Pforzheim (Germany). It is soldered to a thin platin-plate, which has only to be soldered to the molar band. The practitioner is consequently freed from the construction of the lock.

*Transactions of European Orthodontological Society.

THE SPRING-BEAM APPARATUS*

By Dr. Paul W. Simon, Berlin, Germany

THERE is no doubt that there are a great number of excellent orthodontic appliances with which the experienced practitioner can obtain good results. Nevertheless, you will discover here and there faults in the apparatus, and of course you will consider how to correct these shortcomings by an altered and new construction, and perhaps make a small step toward a perfection which can never be fully reached. In the same way, after having often tried all the methods known, I want to show you a new combination called the "spring-beam apparatus" which has proved very satisfactory in a great many cases for about two years.

Before stating the most characteristic peculiarities of this new apparatus and comparing it to the best known other types, I want to explain to you its quality, manufacture and efficiency.

The construction of the spring-beam apparatus goes back to the "beam apparatus," which I have formerly described (in Dr. Bejachs' calendar for dentists, 1925 and 1926). It consists of two bands on the first molars with tubes buccally and a beam on the lingual side either inflexible or elastic, which goes frontally to the canines. The labial arch by its "knee-bends" turns the molars around the vertical axis with the mesial edges buccally. This rotation is transferred to the beams, so that a stronger expansion of the front part is attained (as usually desired), and without any ligature (Fig. 1).

I have indicated for this beam apparatus a new type of molar bands, the tubes of which can be bent very simply in the mouth in each direction (Fig. 2). These flexible tube bands are made of Wipla metal. The "Wipla metal" is rustless steel manufactured by Krupp in Essen, Germany. With their help the knee-bending of the arch can be made very easily, because a similar bending of the tubes also affects the rotation of the molars and therefore of the beams.

The spring-beam apparatus retains the very efficacious principle of the beam apparatus; it contains only some improvements which are essential from a mechanical and orthopedic point of view.

The apparatus consists of the following parts:

The molar bands, called "spring-beam bands," are common anchor bands. The screw lies buccally, the thread turned frontally. A short round vertical tube 2 mm. long is fastened to its forward end, while on the lingual side there is the ordinary beam 1 to 1.5 mm. thick (Fig. 3). These bands are made of Wipla metal; the beam is rather long and is shortened on the model and shaped to correspond to the teeth. This can also be done very easily in the mouth.

The arch belonging to the apparatus is called the "spring arch" to dis-

*Paper read before the European Orthodontological Society.

tinguish it from the ordinary expansion arch, because it acts in all directions (transverse, sagittal and vertical) only as a spring and has no screw. It consists of elastic Wipla wire 0.7 mm. thick. This wire wears as excellently as platinum-gold in the mouth.

The bending of the arch seems at first a little complicated, but with some practice it can be accomplished without any difficulty. It is done in the following way:

On the working model the molars are cut free medially and distally and the bands are adjusted. Of course, you can also adapt the bands in the mouth and take an impression with them in position. To make the spring arch (Fig. 4) we take a 0.7 mm. Wipla wire of 25 cm. in length and bend it at a

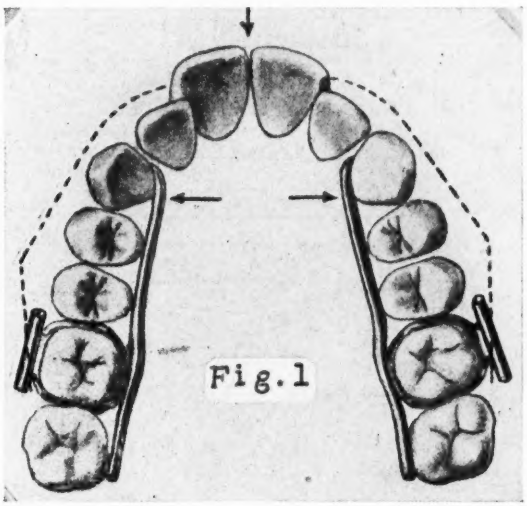


Fig. 1

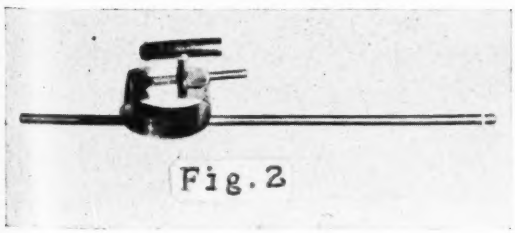


Fig. 2

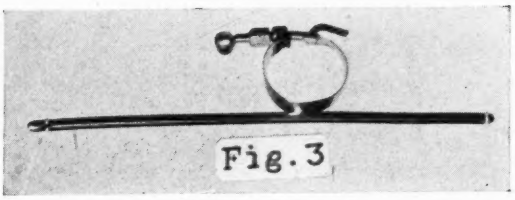


Fig. 3

point 6 cm. from one end sharply round and together with pliers, so that the two sides come into touch with one another. Now 5 mm. distance from this point each of these sides has to be bent at a right angle so that the long and the short ends of the wire are running in a straight line (Fig. 4, No. 4). In this way a recurved pin has been obtained, fitting into the vertical tube of the spring-beam band, which is put into it from the occlusal side. The short end of the wire goes distally, and on the spot where the band is interrupted for the attachment it is bent cervically in a round curve 2 mm. in width, and afterward is bent back frontally, so that the end is leaning against the recurved pin jutting out from the tube. The wire is bent around this pin in the form of a little ring and the surplus is cut off (Fig. 4, Nos. 6 and 7). The distal

end of the loop has to be bent a little outward with pliers (Fig. 4, No. 8); the loop will then adapt itself quite tightly to the thread of the band.

Tube, pin, backward loop and ring together represent the "lock" of the apparatus. The backward loop of the lock, after having been bent completely, is pressed together with the fingers so that the ring about the end of the pin presses the pin into the tube. It may also be useful to bend the free side of the loop which bears the ring a little outwardly, because then the pin can be fitted more easily into the tube.

Now the original labial arch which is formed by the long end of the wire (to the lock of the other side) is bent. This wire is bent rectangularly, cervically close in front of the pin, then taken round occlusally in a semicircular

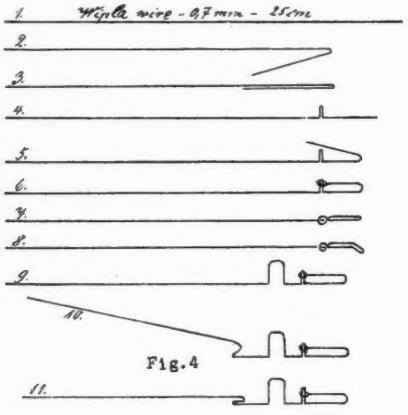
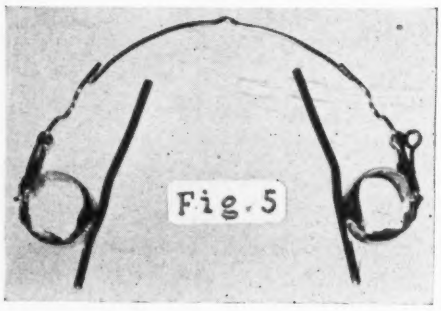
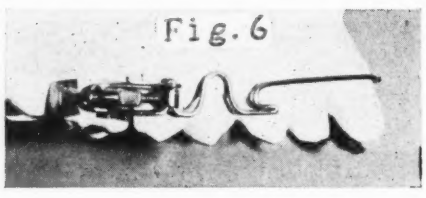


Fig. 4





loop and brought back into the horizontal plane by a second rectangular bend exactly the height of the first. Height and breadth of the loop are to be about 6 mm. (Fig. 4, No. 9). This loop gives the sagittal elasticity of the arch in a very simple way, as you know already. Dr. Federspiel (Milwaukee) has devised very useful pliers for bending such loops.

The wire is now bent in such a way that it lies close to the incisors at the height of the papilla. But you can also shape it as a high labial arch according to Lourie and afterward supply it with auxiliary springs.

On the other side the loop and lock are bent in the same way, only in an opposite direction. It is necessary to keep to the right measurements.

It is very easy also to shape the hooks for intermaxillary elastics at the same time as shown in Fig. 4, Nos. 10 and 11.

Fig. 5 shows the spring-beam apparatus. The lock-ring of the right side is not yet closed.

Fig. 6 gives the side view of the apparatus on the model.

Fig. 7 shows the lock from the buccal side, Fig. 8 from the cervical.

The Wipla wire cannot be repaired by hard soldering, if it should break in bending, but the danger of a rupture is very small and one soon learns to bend so carefully that a rupture never occurs.

The presumption that such a prompt effect of the spring arch will take place is supported by its solid fittings and by the lack of lateral ligatures. The lock of the spring arch fixes better than I have found in any other lock; there is no loss of power through the loosening of the anchorage. The ligatures are responsible for these losses, because after a short time they usually get loose. These are avoided with the beam apparatus. It goes without saying that thereby also the danger of caries is reduced. I also want to mention that the spring arch needs no particular fixation, even if it is worn only in a passive way.

One must not overlook that the first molar is moved bodily according to the vertical arrangement of the tube. Consequently the stimulus to growth on the most important area of the jaw is particularly good. Lately objections

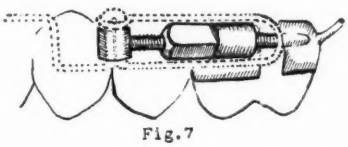


Fig.7

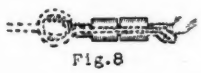


Fig.8

Figs. 7 and 8.—These were drawn by the author in red and black. In reproducing them the red lines were changed to dotted ones for convenience in printing.

have been made to the mechanical bodily movement, as root resorption could be proved by x-rays. These objections seem to me justified in applying screw apparatus either for expansion, which is uncommon, or for sagittal extension, where it is still very often used, at least in Germany. The above-mentioned danger does not exist with the spring-beam apparatus because all is softly elastic, especially the pins at their attachment to the arch.

From the patient's point of view this apparatus surely represents an advance on the screw arches. The tiny lock and the fine bendings rather impress on the patient that the treatment means no mechanical and clumsy use of force, but a soft and careful influence, and augment his confidence. Friction and injury of the gingiva do not occur, as the spring arch fits closely to the dental arch and has no sharp points. Besides, the fine arch is very little conspicuous and can be made completely invisible as a high labial arch.

All the bending can be done with the fingers and one or two pliers and should be performed as exactly as possible and in a regular form.

When putting the apparatus into the mouth, the two anchor bands are first cemented. Then one pin is put into the tube and shut by lifting the side with the ring with pliers and putting it above the pin. The same is done on the other side. In order to obtain arch expansion the spring arch has to be

flattened with the fingers in front, so that it runs nearly in a straight line. Next the ends, that is the backward loops, have to be slightly bent to the inside. If the spring arch with the pin is now put into the tubes, it fits closely to the dental arch (Fig. 9).

By this means the tubes are softly drawn outward by the frontal flattening of the arch, and with them all the lateral teeth from the canine to the last molar. At the same time the backward loops effect a lingual pressure on the distal part of the molars, so that a rotation of these teeth and of the beams, that is, an expansion which is stronger in the frontal part, is performed just as with the simple beam apparatus.

The handling of the loops for sagittal elasticity is so well known that I need say no more about it.

The particular characteristics of the spring-beam apparatus which I consider as improvements are the following:

Its effect on the bones of the jaws may be called very favorable from an orthopedic and biologic point of view. No screw at all is used. The elasticity

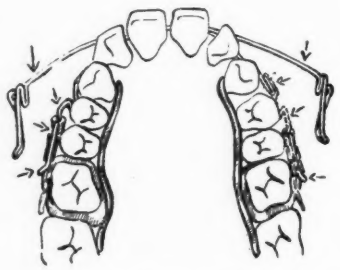


Fig. 9.—The arrows in this figure point to those portions drawn in red by the author in his illustration.

is very great, but sufficient even for adults. The desired success in tooth movement is sure to result after some weeks without the patient's having any pain. On account of this soft, gradual and painless influence the prognosis for permanent retention must be considered extremely favorable. The long duration of the effect of elasticity is very pleasing, so that a new adjustment is only necessary at great intervals. Of course, it depends upon the degree of the anomaly—there are cases where the desired movement is obtained by the first adjustment of the spring arch within two or three months.

DISCUSSION

Dr. Barrows said he had seen one of Dr. Simon's patients who had the appliance, and it was quite a revelation to him; it was a most extraordinary sort of appliance, but it did really widen the arches. It was always clean, being of rustless steel. He should like to ask Dr. Simon what effect the steel had upon the decalcification of the enamel. Appliances used to be made of platinum, and he thought that was one of the worst metals that could be put into the mouth. Formerly, German silver was used, which contained a certain amount of copper and had an antiseptic effect on the teeth. He should like to know whether the metal mentioned had any detrimental effect, and whether it formed less acid than platinum, a metal which he thought created acid. Further, he should like to know if there was any objection to making the tube on the band square instead of round. It had struck him that at a certain stage if the tube were square it would be possible to get a better

control than if it were round. As far as he could see it was a wonderful metal, and the new appliance was a very splendid one.

Dr. O. Henry complimented Prof. Simon on his paper and said the method was most applicable in some cases. The treatment of expansion which he had mentioned conformed with Class II cases. It was necessary to rotate the anterior buccal cusp of the first molar in all Class II cases, and with the doctor's mode of shaping the wire he created an expansion from the anterior buccal cusp forward. He had had the pleasure of seeing one of the appliances on a patient of the doctor's, and in some hands he thought they would be working too quickly and create trouble, for instance, absorption by rotating the molars too quickly. That, however, was the fault of the application. It was all right in Dr. Simon's hands, but in inexperienced hands it was necessary to go very carefully. It was marvellous, as Dr. Barrows had said, that arches so constructed should be so clean in the mouth. He also wished to know whether rustless steel had antiseptic qualities when in the mouth, and he hoped that the wire could be used for other parts of appliances.

Dr. Dreyfus said he had the same appliance but with solder, and the fact that there was no solder used in Dr. Simon's case was very interesting.

Dr. Knoche said he had used rustless steel for loose teeth and found it had no effect on calcification, although he had seen the patients a long time afterward. The wire was very good and could produce excellent work.

Dr. Dreyfus said he had a patient now who had the wire in the mouth and found it was an excellent material.

Dr. Korkhaus said Dr. Simon's paper was extremely interesting, and it could not be doubted that in the case of bilateral symmetrical contraction of the arch, the apparatus could be used with excellent success. But the respective cases were not always so favorable, and the turning of the molars—on which the efficiency of the apparatus was totally depending—was often not indicated. The unavoidable connection of that turning of the molars and the buccal movements of the other side teeth were therefore a great disadvantage. For that reason he considered personally the lingual arch of Mershon far better for the expansion of the arch, as he (Dr. Kirkhaus) could do justice, with that apparatus, to all situations and could extend the arch with or without rotation of the molars. Also the use of the U-loop for the retrusion of the front teeth was not to be recommended, as the flattening of the loop gave great difficulties and could only be used by an experienced orthodontist. An Angle labial arch was to be preferred, which was freely mobile in a sagittal direction by the action of the intermaxillary rubber bands. The spring-beam apparatus indicated only one method of expanding the arch and could not be used for any other movements, as, for instance, for the simultaneous protrusion of the front teeth, the mesial or distal movement of the premolars, etc. In the careful cooperation of the lingual arch of Mershon and the high labial arch of Lowerie (the latter one only when needed) lay a system which performed all possible movements simultaneously, and which exercised with the help of fine finger-springs the least possible pressure, and permitted the teeth to take their places according to the influence of the functional forces. Treatment according to the system he had applied at the clinic of the University of Bonn during a period of three years to his complete satisfaction; his experiences in that respect he had laid down in a recently published book. He considered the advantages of the system extremely great, as they unburdened the practicing orthodontist, thus enlarging his practice regarding a greater circle of patients.

Dr. Hipwell thought the lingual lug mentioned would be just as effective with a smaller wire, and he should like to know if a single simple band would not have the same effect as the band used. After getting Dr. Simon's book he should be able to appreciate the matter a great deal more.

Dr. Stewart asked how Dr. Simon soldered his band on the teeth.

Dr. Simon said with regard to the antiseptic qualities of the metal, Dr. Knoche had answered the question. In his experience the teeth were especially clean by using the B —— metal, but he could not say whether the metal had special antiseptic qualities or

not. With regard to square tubes, he thought the tubes had to be round so that the pin was able to turn in the tube, but there was the possibility of making them square. If the molars did not require to be turned, then it was possible to take pliers and press the tube together, and with two pliers draw one end in one direction and the other end in the other direction.

It then fitted quite exactly and very tightly into the tube as though it was soldered, so that there was fixation of the labial arch without turning the molars. It was easy to change the arrangement of the beams. There was a satisfactory anchorage, only the one molar going buccally. Also it was possible to lengthen the one beam so that it went behind all the incisors. There was a very good anchorage in that part of the jaw, and the force of expansion was only affecting the other side.

There were many possibilities of doing work without any ligatures, and work that could be done very easily. He was not of opinion that in all cases of anomalies spring-beam apparatus should be used; there was no apparatus in the world which could be used in all cases. The lingual arch and other arrangements could be used in some cases, but he had found that in the average cases the type he had mentioned was of universal use.

A NEW ORTHODONTIC SYMMETROGRAPH*

By Dr. G. Korkhaus, Bonn, Germany

MODERN orthodontic diagnostic, which has been consolidated by van Loon, Simon and others in the last ten years, originates from a procedure which Körbitz devised some years ago, and which he named symmetrical comparison. The study of symmetry, which is one of the most reliable qualities of every organ with bilateral parts, is facilitated in the maxilla by the sutura palatina, which as a distinctly elevated ridge, the so-called raphe palati, runs along the hard palate. The transverse line, which is perpendicular to this middle line, permits study of the sagittal symmetry of both sides of the jaws.

To avoid the necessity of noting down the transverse lines, a number of apparatuses have been constructed to facilitate and to perform more exactly symmetric comparison. The "symmetroscopes" (according to Grünberg, Friel, Zielinsky, Zawitzky), with which symmetric proportions were established by viséing with the help of cross-wires, were followed by the considerably improved symmetrographs, which draw the symmetric lines directly on the model. The excellent apparatus, designated by van Loon, can, however, hardly be used in practice owing to its high cost. That constructed by Simon is more often possible, but it shows a number of disadvantages with long handling. I have, therefore, endeavored to construct a different symmetrograph, which does away with these disadvantages. It combines the following attributes:

(1) Absolutely firm fixing of the model.

(2) Fixing of the model only once in any position and without further adjustment; in consequence all measurements must be possible without loosening the fastenings.

(3) Avoiding the slipping off of the crayon to the sides, achieved by a firm guide.

DESCRIPTION OF THE APPARATUS

The symmetrograph consists of a fundamental plate and a bridge, carried by two pillars, which are in the exact center of the fundamental plate (Fig. 1). Over the bridge runs a slide, which holds in a rule-joint a pointed crayon. This crayon is in the same plane as the slide and is freely movable but can also be fixed by a simple manipulation in a vertical position to the fundamental plate. It has, starting from the other nonpointed end, a graduated scale.

The most important part of the apparatus is the fundamental plate. It consists of an immovable part, carrying the pillars, and of three movable parts, permitting together unlimited rotation of the model once fixed. A square plate, which rests upon the principal part of the apparatus, can be moved in one direction. It has in the center a circular opening and carries here a

*Paper read before the European Orthodontological Society.

freely movable circular plate, and around this a narrow band, which is fitted with a catch on the lower side, the object of which is to limit the circular movement automatically to a turning of 90 degrees. The central rotation plate has three adjusting pegs, which permit an absolutely firm fixing of the model.

While the slide moves from left to right and vice versa, the fundamental plate can be altered in a forward and backward direction and has, furthermore, an unlimited rotation and another movement limited to 90 degrees. These movements can be performed with the help of adjusting screws jointly and separately, as needed. Different graduated scales on the fundamental plate and on the bridge permit an exact following-up of the movements, and also serve other purposes, which will be described later on.

THE HANDLING OF THE SYMMETROGRAPH

Naturally, only a model whose surfaces are perpendicular to the median raphe can be used. The symmetrical comparison is now performed in the following way: the model is fixed once for all measurements; this can be done in any position wanted, as the all-round rotation of the base permits this. One has only to place the model in such a position by shifting the fundamental plate and by turning the rotation plate, that the freely oscillating crayon touches two points of the unchangeable raphe. This adjustment, which has to be fixed at once, is the starting-point for all future measurements.

One can, however, simplify this adjustment of the model, when the model is fixed from the start in such a way that all movable parts of the apparatus are at 0, and the vertically adjusted crayon meets one point of the raphe. It is not necessary to hold the model by hand, as this duty is fulfilled by the crayon, which with its point moves upon the surface of the plaster of Paris. The model so fixed is now turned with the help of the rotation plate, till the crayon, now oscillating freely, touches a second point of the raphe. This position is maintained by fastening the screws, and the raphe-plane is drawn across the front and the back surface of the model (Fig. 2). The crayon is freely mobile in its plane by virtue of the slide and the rule-joint, the special construction of which will do away with all undesirable movements, so that it cannot slip off any unevennesses of the plate.

For the same purpose, one now has to set the model of the mandible in occlusion with the maxilla and draw the raphe-plane on the side and lower surface of the model.

With any other symmetrograph the model must be taken out of the fastenings for the further course of the procedure, and fixed again after the turning of 90 degrees. This is no longer necessary with the new apparatus. The little screw for the turning of the 90 degrees is loosened and the rotation plate is turned so far as the catch below the band will permit it, i.e., exactly 90 degrees. The little adjusting screw of the outer circle will then be fixed again, and the base plate is made free by loosening the big screw.

For the measuring of a gnathostatic model one has to shift the fundamental plate to such an extent that the visible ridge projection of the orbital plane on top of the palate is touched by the crayon. This transverse line is

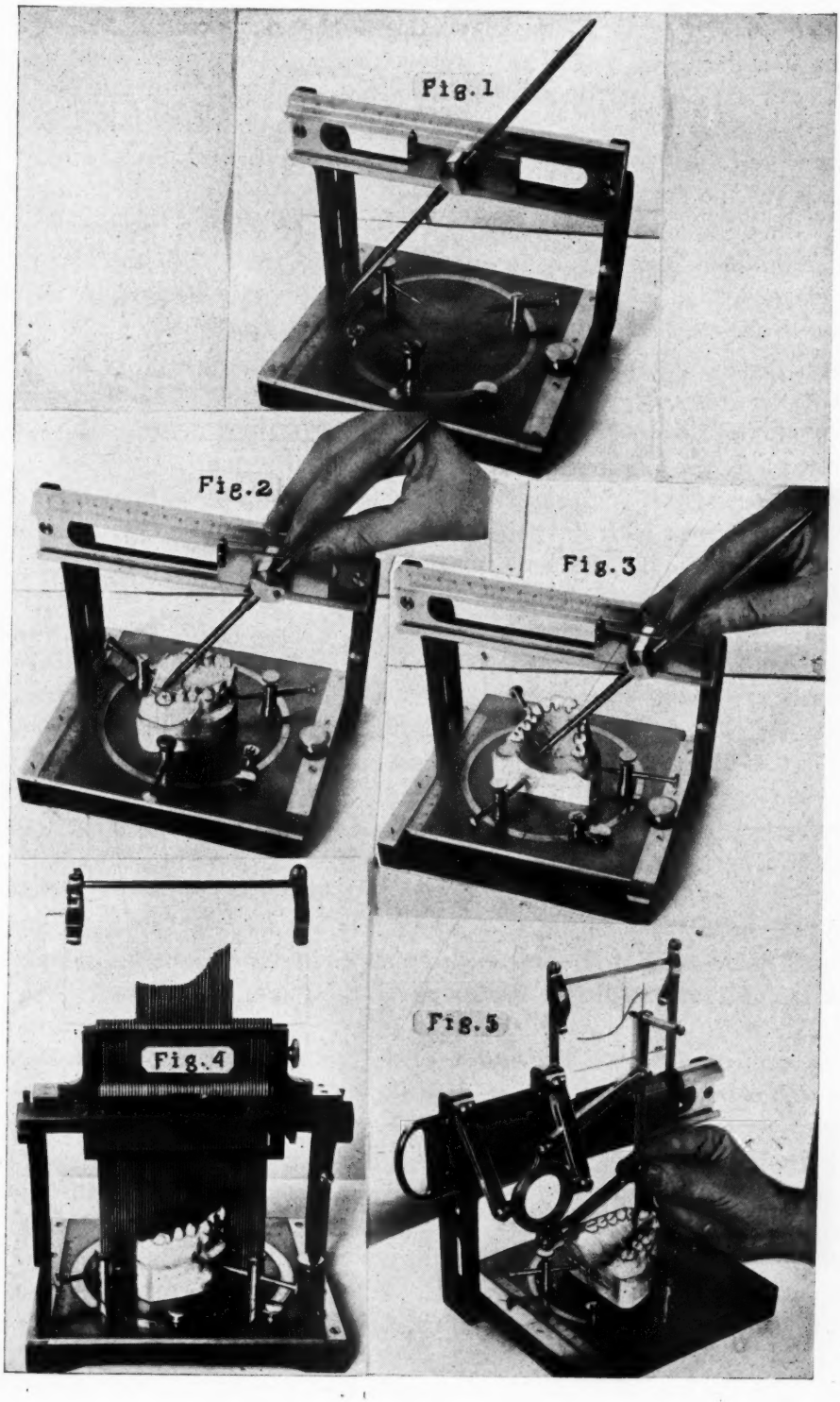


Fig.1
Fig.2
Fig.3
Fig.4
Fig.5

then marked. With a model marked in another way one starts best behind the last tooth of the row of teeth and draws here a transverse line (Fig. 3).

The new symmetrograph shows automatically the way the model has to be moved. By gradual shifting of the fundamental plate, 5 to 10 mm. every time—a manipulation easily followed up by the scales on the sides—as many transverse lines are drawn on the model in a few seconds as are considered necessary for the symmetric comparison.

All lines can also be transferred—without any further ceremony—to the model of the mandible, simply by placing it in occlusion with the maxilla. To avoid the repetition of these manipulations one does this at once, following the drawing of the respective lines on the model of the maxilla.

Also for the establishment of the transverse symmetry the apparatus can be used advantageously. The distances of the side teeth from the raphe will be read off the scale on the bridge by simply shifting the crayon, which for this purpose is fixed automatically in a vertical direction.

Also the sagittal and the transverse diagrams, proposed by Simon, can easily be performed with the help of this apparatus, and this without the different measuring apparatuses of Simon.

To assist the overburdened practitioner in the construction of curves, I have constructed finally a portcullis (Fallgitter), as I saw it some years ago at van Loon's (who is therefore the creating genius of this procedure). This additional apparatus consists of a great number of fine bars which are kept together by two screws. After dismounting the slide it is simply placed on the bridge of the symmetrograph. The bars are now in the same plane as the crayon before. By loosening the screws the bars drop and form in the same moment every desired curve of the palate in a sagittal and in a transverse direction (Fig. 4), which then can easily be transferred to any millimeter paper with a flat pencil.

After the construction of each curve, the screws are tightened again, the portcullis dismounted and reversed, so that the bars drop again after loosening the screws, and with this manipulation the apparatus is freshly "loaded" again.

My endeavors of late were to simplify the construction of the curve diagram. These experiments have lead finally to a drawing apparatus which has proved very satisfactory (Fig. 5). With a simple steel wheel one goes over the desired line of the palate, after the model has been fixed in the proper direction; and an automatic writing device notes down at the same time the curve on millimeter paper. Also the relations to other planes, as for instance to the Frankfort horizontal line and the orbital plane, can be ascertained exactly with the help of this apparatus. Different curves can also be projected into one another and marked down with different colored pencils. The examination of the curves of the palate of deformed jaws permits an interesting insight into the extent of the participation of the palate in the anomaly, and furthermore into the alterations of the arch during treatment.

The symmetrograph with the portcullis and the drawing apparatus are manufactured by the firm Otto Otto, Hildesheim, Germany.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

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ROOT DEVELOPMENT IN CONNECTION WITH DENTAL PATHOLOGY AND WITH ORTHODONTOLOGY*

By Professor Angelo Chiavaro, D.D.S., M.D., Genoa, Italy†

WHEN the authors of subjects pertaining to special dental pathology treat, in textbooks or monographs, of the diseases of the dental pulp, usually they divide them into acute and chronic, giving due importance to the presence or to the absence of infection.

They consider the tubular dentinification, the secondary dentine and the pulp nodules as products of irritation of the unexposed dental pulp. While they admit that the acute diseases of the dental pulp, being caused by persistent violent actions, progressively produce hyperemia, stasis and, in cases of exposed pulp, inflammation, followed by moist gangrene, they do, on the other hand, admit that the dry gangrene follows persistent injuries of the unexposed dental pulp.

The dental pathologists consider as chronic diseases, caused by persistent slow actions: the fungus hypertrophic pulpitis, the ulcerative inflammation of the pulp and, as possible complication, they describe the pulp abscess. They describe also the calcareous infiltration, the fibrous metamorphosis and the fatty degeneration among the chronic diseases.

From this brief exposition we should come to the consequent conclusion that the same exciting and predisposing causes, when acting upon the dental pulp, may give origin to different kinds of diseases of progressive and regressive character, in harmony only with their slow, violent, acute, or chronic action.

No writer of dental pathology, so far as we know, has yet taken into consideration, with the above conditions, other adjoining or modifying elements in order to give to the student a more satisfactory classification of pulp

*Lecture given at the Pacific Coast Dental Conference, July 10, 1929, and at the University of California Dental School in San Francisco, Calif.

†From the Royal University of Genoa, Italy.

diseases; the present one is, in our opinion, somewhat inadequate to explain the existing problems of pulp pathology. In fact, for instance, we do not know why, in the same mouth, some pulps are able to defend themselves against the invasion of exciting causes with their constant and active production of secondary dentine, while others fail to act with such a natural defense against injuries, with the result of their total death.

We do not know why in some dental pulps we find the production of secondary dentine and in others pulp nodules both of which are absent in other teeth with apparently the same external pathologic condition. We do not know why, under seemingly the same conditions, some teeth react so quickly to arsenical applications and some do not; why insignificant erosions or abrasions of some teeth give rise to excruciating reflex pain and large cavities of some others, even with exposed pulp, are not so painful; or why some dental pulps submitted to light trauma die, and others do not die even if struck by a powerful blow.

In the face of such puzzling problems we come to the conclusion that the actual classification and the knowledge of pulp diseases are not satisfactory, but that some other important element of fundamental importance is yet to be found and to be considered if we wish to answer the above-mentioned questions and to understand and handle more scientifically pulp pathology.

Some time ago, looking for such a needed element, we noticed that there was some evolving difference in the pathogenesis of dental pulp between the teeth of young and of elderly patients. Considering, in such cases, the anatomic conditions of the apical region of the teeth, we recalled the developmental changes which occur in these regions from the time of the appearance of the first deciduous teeth to the age of about twenty years, when the roots of the third molars are often not yet complete, while the crowns of these latter teeth are decayed. Coming to the conclusion that the age of the patient and the state of dentinification and cementation of the roots of the teeth in dental pathology ought to be given due consideration, we became convinced that we have to contemplate in dental pulp diseases the transitory, but important, and different anatomic conditions of the roots of the teeth either when they are incompletely formed—that is with apical foramina more or less widely opened and widely communicating with the surrounding connective tissue—or when they are completely formed—that is with apical foramina normally restricted. We thought that surely the dental pulp pathology, in the two different cases mentioned, could not be the same, even if the authors, as yet failing to take into consideration such an important and fundamental anatomic fact, have exclusively considered the pathogenesis of the dental pulp as evolving only and always in teeth with roots completely formed. They certainly knew that both deciduous and permanent teeth during a certain period of development are more subject to external injuries, like trauma and dental decay. To repeat, teeth have for a certain period of months and of years roots incompletely formed, hence widely opened; but the authors have not given any consideration to the fact that such anatomic condition was fundamental in the pathogenesis of the dental pulp.

In relation to the above observation, in our daily clinical work we have considered the evolution of pulp diseases in harmony with the coexistent anatomic condition of the apices of the roots. In fact, we have been able to notice that, when the dental pulp is in direct, wide-open continuation with the surrounding connective tissue, it is very resistant to any chemical, physical or bacteriologic irritation or aggression, so that if it becomes ulcerated the purulent process destroys it not *in toto* but layer after layer. This is because the dental pulp received abundant blood supply through the large opening of the end of its developing root portion, and its tissues cannot become strangulated by the compression of the enlarged arteries against the unyielding ring of the apical opening, as occurs in teeth with apical foramina normally restricted. In the latter case, any persistent irritation is the cause of the "total aseptic necrosis" or "total moist gangrene" in relation to the absence or presence of pathogenic microbes.

We believe that it is enough to point out the anatomic coexistence of the different transitory apical conditions of the roots of the teeth during their development, in order to consider the different pathologic results that must follow the injurious, exciting and predisposing causes—external and internal, slow and violent, physical, chemical, and bacteriologic.

Now, before proceeding any further, we must here explain that we have found it a great help in the exposition of dental diseases to our students, to attribute to the use of the two words phlogosis and inflammation, the following different signification, accepted as yet by only a few general and surgical pathologists, but by none of the dental pathologists: "phlogistic process" or "phlogosis" is a condition of the tissues anatomo-pathologically similar to inflammation, but in which pathogenic microorganisms are absent; "inflammatory process" or "inflammation" is the known pathologic condition, in which microorganisms are always present.

The following tabular synopsis, which states comprehensively what we have already tried to elucidate, was compiled about six years ago for our students:

A New Tabular Synopsis of the Diseases of the Dental Pulp in Harmony With Anatomic Apical Conditions

Teeth with roots incompletely formed (With apical foramina widely opened)	Teeth with roots completely formed (With apical foramina normally restricted)
(a) Acute Diseases Without Infection (Caused by violent action)	
1. Hyperemia.	1. Hyperemia.
2. Stasis.	2. Stasis.
3. Phlogosis.	3. Phlogosis.
	4. Necrosis (dry gangrene).
(b) Chronic Diseases Without Infection (Caused by slow action) *Chronic Phlogosis*	
1. With tubular dentinification.	1. With tubular dentinification.
2. With formation of secondary dentine.	2. With formation of secondary dentine.
	3. With the production of nodules.
	4. With sclerosis.
	5. With calcareous infiltration.
	6. With fibrous metamorphosis.
	7. With fatty degeneration.

(c) Acute Diseases With Infection
(Caused by violent action)

1. Hyperemia.
2. Stasis.
3. Progressive ulcerative partial inflammation.

1. Hyperemia.
2. Stasis.
3. Total inflammation.
4. Total moist gangrene.

(d) Chronic Diseases With Infection
(Caused by slow action)

1. Hyperemia.
2. Stasis.
3. Partial inflammation with fungus hypertrophy.
4. Partial ulcerative inflammation with pulp abscess.
5. Progressive ulcerative partial inflammation.

1. Hyperemia.
2. Stasis.
3. Total inflammation.
4. Total moist gangrene.

We have found in our clinical experience as yet only one exception to the above classification: That was in deceased pulps of maxillary molars. At times we have noticed that the radicular pulp of one of the three roots of upper molars was still sensitive, while the coronal pulp and the radicular pulp of the other two roots were affected by the gangrenous process or destroyed by the action of arsenical application. We submit that in such cases the molar being in the developing state, only the root with sensitive pulp remained with wide-opened end; or, if the patient was an adult and the molar had completed roots, the penetration of artery or arteries was through a separate foramen, in which case the constriction of the vein or veins, coming out alone through some other foramen, was impossible; that is, the outlet was free and the pulp did not die. At any rate, these and perhaps other exceptions are also equally connected and in harmony with anatomic apical conditions. In relation to the above classification of pulp diseases, we believe it to be rather simple to come to the following practical considerations:

1. The application of arsenical paste in teeth with roots incompletely formed is either inefficient or dangerous. But we have demonstrated clinically that instead the application of other escharotics, for example phenol or creosote, in such instances aided by slight compression acted successfully in destroying the dental pulp after a few applications. In these teeth we have never found pulp stones, sclerosis, calcareous infiltration, fibrous metamorphosis, or fatty degeneration.

2. We have found the capping of the dental pulp, under special technic, in teeth with roots incompletely formed, to be successful.

3. A violent orthodontologic traction, mechanical or surgical, is possible without unfavorable pulp reaction on teeth with roots incompletely formed.

4. The intensity of the reflex symptomatologic pain of diseased dental pulp is in relation to the more or less restricted apical foramen, when through it the nerve is accompanied by the artery.

5. Special technic and material are needed in filling the root canals of teeth with incompletely formed roots.[1]

6. The periapical infection, which is followed by the consequent forma-

tion of abscess in case of putrescent pulp, is only possible in case of teeth with roots completely formed.

In conjunction with what has been demonstrated, it is clearly to be seen that the use of the radiograph, in conjunction with consideration of the age of the patient, is imperative.

Perhaps some more useful and practical deductions could be made in relation to other pathologic dental conditions of affected teeth if these, henceforth, shall be considered in harmony with their anatomic apical conditions.

REFERENCE

1. Chiavaro, A.: Scarlet Red and the Filling of Pathological Bone Cavities Applied to Dentistry, Dental Review 27: 599-613, 1913.

ABSTRACT OF
CURRENT LITERATURE

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA
DENTAL RADIOGRAPHY
By Dr. Edward Preble, New York City

NUTRITION AND PEDIATRICS
By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Orthodontia, Oral Surgery, Surgical Orthodontia and Dental Radiography

Epulis. E. F. Tholen and F. S. Balyeat (Los Angeles), Pacific Dent. Gaz. **37**: April, 1930.

This ancient clinical term should doubtless be discarded, but the authors prefer to retain it and to distinguish between true and false epulis. The true form shows much variability clinically and on its incidence but under the microscope is either a benign fibroma or a giant-cell neoplasm of low malignancy with occasional metastases. It may, however, be necessary to examine many slides of a fibroma before finding a giant cell. Histologically the giant-cell epulis is a sarcoma of mixed type—round, spindle, and giant cells, the latter unusually abundant as a rule. A giant-cell epulis therefore is a giant-cell tumor *par excellence*. But clinically epulis does not usually behave as a sarcoma. The general condition is usually good, even in the larger growths. The clinical picture may be summed up as follows, a slow, usually painless growth near the gingival margin, most often seen between the ages of twenty and fifty years, and more frequent in females. Carious teeth, shell crowns, calculus, etc., may coexist, suggesting casual factors. There is generally good general health with absence of glandular enlargements. There are many exceptions to these generalizations, so that the microscope alone can make the diagnosis. The authors do not mention biopsy perhaps because such growths are usually removed on general principles and can be examined then.

A New Approach to Caries—Pyorrhea. F. W. Broderick (London), Dental Magazine and Oral Topics **47**: April, 1930.

The theory of Broderick is that caries develops as a result of an acidosis, neutralization of which exerts a drain on the alkaline reserve. Pyorrhea, on the other hand, develops in the presence of hyperalkalinity which is heralded by a deposit of salivary calculus about the roots of the teeth. Both affections are, therefore, diseases of metabolism. Dentistry still lingers in the

bacteriologic stage of pathologic evolution, so that we are prone to seek a bacteriologic cause of the chronic infections. This is only one link in the chain, for bacteria can infect tissues already diseased and may incidentally set up vicious circles, as by further lowering of resistance. Caries brings about periapical infection, and the granuloma may be visualized as a defensive barrier against systemic infection rather than the source of the latter. Caries and periapical infection seem naturally related to rheumatoid infections, while there is an undoubted relationship between pyorrhea and gastric ulcer. The reaction of the saliva constitutes a better index of the general health than the state of the blood and urine. No purely local factor can be assigned as a cause of these infections, and the endocrine system is readily seen to figure in their causation as well as in the state of metabolism.

Oxalic Acid as a Factor in Caries. B. R. Badanes (New York), Dental Cosmos **52**: May, 1930.

The author first calls attention to the fact that calcium oxalate is an important ingredient of a salivary calculus. The oxalate may preexist in the saliva or be formed in the mouth. Other oxalates, as well as the free acid, soon become converted into calcium oxalate. Its formation in the mouth is supposedly due to carbohydrate fermentation, the same as that which causes the formation of lactic acid. The latter in fact is transformed to oxalic acid, and both acids combine with the calcium in the buccal contents. The author seeks to show that oxalic acid may be a factor in the production of simple erosion, and lactic acid has long been accused as an important factor in the same process. He is able in certain cases studied to exclude the agency of lactic acid and therefore is the more inclined to accuse oxalic acid. Either the latter or a soluble oxalate can attack dentine, while the insoluble oxalate can act only in a mechanical manner by forming salivary calculus. Authorities have mostly neglected to consider oxalic acid in relation to erosion and caries and have concentrated too much on lactic acid and acid sodium phosphate.

Elimination of Dental Fear. A. Porter S. Sweet (Hornell, N. Y.), Dental Digest, May, 1930.

The author advocates the use of psychologic charts for patients about to undergo dental operations. Suggestion is of value as a general measure for all, as conveyed by the dentist's personality and his office background, but every case must be individualized. To secure this end the author has analyzed a large number of patients in regard to the degree and kind of fear. First he notes approximately the intelligence quotient, making 100 the normal and 115 the maximum. Evidences of fear are characteristic, as dry mouth, excitement, etc. Mild fear may show no reaction, while in some cases the patient actually runs from the chair. When fear is suppressed, the forehead and palms of the patient may be damp. The evidence of the patient or his friends on his fear reactions may be of value. Naturally the patient must be convinced that local anesthesia will really control the suffering, and the operator must never seem to be in a hurry in this connection. In the chart one

must record such fear reactions as shrinking, cringing, clinging, etc. Patients who can suppress their fear have much advantage over the other types.

Resuscitation. W. L. Jones (Columbus), Dental Items Interest **3**: May, 1930.

Considering the numerous opportunities for resuscitation in dental practice, the lack of special literature is surprising. The author covers the entire subject of collapse, whether from fright or shock or from general or local anesthesia. The basic consideration is always the same, a failure of the respiratory center, followed by arrest of the heart—and the treatment should be standardized as far as this is posible. The remedies in vogue stress too much the heart failure by giving heart stimulants such as camphor, strychnia and adrenalin. It is the respiratory center which must first be activated. Moreover, a heart which is in ventricular fibrillation remains unaffected by drugs. Artificial respiration in the prone position fills two indications: to rouse the respiratory center and to antagonize fibrillation. To this should be added inhalation of oxygen and carbon dioxide. Mechanical devices like pulmotors have a limited usefulness because the indication to inflate the lungs is not all that is necessary. In summing up, the author gives the following standardized formula for resuscitation: no drugs; artificial warmth; artificial respiration; inhalation of oxygen 95 per cent, carbon dioxide 5 per cent; recumbency and absolute rest until resuscitation has been affected. The author derides the newspaper accounts of resuscitation by injecting adrenalin into the heart as fabulous.

Nutrition and Pediatrics

Erysipelas in Infancy and Childhood. John A. Foote. Southern M. J. **23**: 1, 1930.

Foote believes that the higher mortality rate of erysipelas in early infancy is due to a lack of immunity to the streptococcus responsible for erysipelas. Although there are many varieties of drugs and forms of local treatment, no one particular therapeutic agent has encountered any appreciable success. Blood transfusion seems to have many advocates as a form of treatment, but Foote says it is less valuable in the infant younger than three months of age than in the older child.

As a result of his observations on the treatment of sixteen infants at Children's Hospital, Washington, D. C., the author believes that the specificity of Birkhang's serum (erysipelas antistreptococci serum) is well established. Just as soon as the diagnosis is made, Foote advocates the prompt use of this serum in full therapeutic doses even for the very young. The full dose at present is 20 c.c. and this should be repeated in twelve hours if necessary.

Endocrine Features of Interest to the Otolaryngologist. Thomas P. Sprunt. Arch. Otolaryng. **11**: 1, 1930.

Sprunt considers the relationship of the endocrine glands to the domain of otolaryngology. An enlargement of the thyroid gland without any definite

evidence of toxemia is termed simple goiter. Aside from its cosmetic disadvantages, the growth of the gland may also interfere with the functions of its neighboring structures, such as the trachea, larynx and esophagus.

Sometimes focal infections are responsible for the occurrence of exophthalmic goiter. Symptoms such as cough, subjective feeling of dyspnea, irregular breathing, and bronchorrhea may result in addition to the usual increase in the general metabolism and marked disturbance of the cardiovascular and nervous systems.

Cases of hypothyroidism are more often overlooked than cases of hyperthyroidism. Some features resulting from a diminution in thyroid activity are the large tongue, dryness of the mouth, and with children particularly, there is apt to be some defective development of the bones of the face. Other evidences in children which point to thyroid deficiency are habitual constipation, retarded growth and mental retardation. Respiratory infection, impaired hearing, dry harsh skin, obesity and recurring drowsiness are some of the more common findings peculiar to hypothyroidism.

One of the important functions of the anterior lobe of the hypophysis is a stimulating effect on growth. Hyperplasia or adenomas of its chromophil cells are associated with a rare condition known as acromegaly. This pathologic condition usually manifests itself in the third decade and is characterized by a marked bony overgrowth involving the facial portion of the skull, hands and feet, and in fact all the bones of the body. Among the early symptoms are headaches, pain in the face, and paresthesia in the head and face.

In regard to the thymus gland, Sprunt quotes freely from the recent excellent monograph of Marine, who states that the function of this gland is unknown, but it resembles the lymphoid tissue closely. He further adds that there is no proof that it has an internal secretion.

In his discussion of the suprarenal glands, Sprunt states that it is evident from experiments that the medullary portion is not necessary for life. Removal of the cortex, however, is fatal.

Perhaps the best known clinical syndrome associated with the pathology of the suprarenal gland as a whole is Addison's disease. Asthenia, gastrointestinal disturbance, low blood pressure and general vascular hypoplasia are some of the marked changes noted in this condition. The disease is perhaps more widely known because of the bronzing which occurs on the skin and mucous membrane. Perhaps the most constant finding in Addison's disease is the occurrence of small bluish-black spots or streaks on the lips, the border of the tongue, the buccal mucosa, the gums and the soft palate.

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EDITORIALS

Panel Dentistry

THE May, 1930, issue of *Oral Hygiene* contains an address on Panel Dentistry by F. N. Doubleday, L.R.C.P. London, M.R.C.S., L.D.S. England, London, England, as presented before the St. Louis Dental Society, March 15, 1930.

The St. Louis Dental Society is to be congratulated for presenting this subject, which is so very poorly understood by the dental profession in the United States. *Oral Hygiene* is to be commended for its service in giving this matter wide publicity. It seems that most societies and journals are afraid to discuss the question of panel dentistry. Perhaps it is not a matter of fear, but rather a lack of understanding. Many of those who do understand the subject, do not believe that panel dentistry is possible in this country.

It is our belief that nothing would do so much as the panel system, as it exists in England, to lower the professional standing of the dentist and the

physician in this country. We often hear the statement that dentistry has developed from the barber shop, for it was the barber who at one time attended to dental duties. Considering its lowly beginning, dentistry has made tremendous strides in becoming the science which it is today. However, with the advent of the panel system as employed in England, it is our belief that the barber would occupy a much higher professional standing than the dentist. The barber is able to choose his clientele and establish his own scale of prices, but under the panel system the dentist is compelled to work for such patients as are apportioned to him by certain friendly societies, fraternal organizations and insurance committees, nor is he permitted to establish his own fee.

Dr. Doubleday in presenting his paper before the St. Louis Dental Society constantly called attention to the fact that the dental profession in America was fast approaching a similar condition to that which exists in England. We suspect that a great many dentists believed Dr. Doubleday was merely "holding forth" and that the panel system is remote in this country.

Labor unions and health organizations are getting a greater control of the affairs of the country each day. In the New York State Legislature an Old Age Pension Bill was passed last year. There has also been introduced in the New York State Assembly, each year for the last few years, a compulsory insurance bill which provides such benefits as are similar to those provided by the panel system in England. This year the bill was the ninth introduced and appeared with the following foreword: "To establish a system of compulsory insurance to furnish benefits for employees in case of old age, unemployment, death, sickness and accident, not covered by workmen's compensation, and for their dependents in case of sickness, accident and death, and to furnish maternity benefits, and to provide for contribution by employers, employees and the state, and to create the health insurance commission." You will note that this preamble covers almost everything. Under the benefits mentioned we find "medical, surgical, dental and nursing attendance, and treatment." We also find included, "laboratory facilities and specialists, medical and surgical supplies." This is followed by: "All necessary medical, surgical and nursing attendance and treatment or other treatment permitted by law and all necessary nursing in connection therewith shall be furnished by the fund or society to insure persons and the dependent members of their families, from the first day of sickness or the happening of an accident, provided notice has been given; otherwise from the date of such notice. In case of disability such attendance and treatment shall not be furnished to the same person for more than twenty-six weeks of disability in any consecutive twelve months. All dental service for necessary extraction and filling of teeth shall be furnished to insured persons by the fund or society." In another paragraph we find that "The fund or society shall provide proper laboratory and other facilities for diagnosis and treatment, and shall make arrangements with specialists, including dentists, for consultation, treatments and operations. Insured persons and the dependent members of their families shall be supplied with all necessary medicines, medical and surgical supplies, dress-

ings, eyeglasses, trusses, crutches, and similar appliances prescribed by the physician or surgeon. Insured persons shall be furnished with all necessary dental treatment and the supplies required for such treatment."

A careful study of this bill shows that the physicians and dentists will be stripped of professional standing and independence by being placed on a panel where they will be chosen by the fund or society and will be compelled to do work for the insured persons at a fee already stipulated by the organization. The practice of medicine and dentistry would be placed under the control of a group of individuals who know nothing about the nature or the value of such services. As a certain number of men would have power in arranging the panel, the distribution of patients would be under political control, and it necessarily follows that political affiliations would have a great deal to do with the number of patients that are assigned.

We could quote many other objectionable features of this system as embodied in the bill which was before the New York State Assembly. We believe, however, that we have given enough to show the profession that panel dentistry in this country is not remote. The only way for the medical and dental professions to combat this is by organizing with strength equal to the labor unions which are trying to "put it over."

If the medical and dental professions are willing to have the labor unions dictate to them, there is of course no need to organize. If the doctors and dentists desire to remain as independent as the barbers, then it will be necessary for them to organize in order to combat such detrimental laws as have been introduced and are gaining headway. Dr. Doubleday admonished us duly.

RESOLUTIONS OF THE AMERICAN SOCIETY OF ORTHODONTISTS

Realizing the increasing interest that is being taken by school officials, health departments and other organizations everywhere, in the improvement of dental health among children, and,

Believing that malocclusion is one of the most serious and important of remediable dental defects, and,

WHEREAS, the disregard of this deformity in the inspection of children's mouths results in misleading reports being sent to parents and otherwise published. Wherefore, be it

Resolved, That the American Society of Orthodontists recommend that all examinations or inspections of the mouths of children for dental defects properly should include in addition to items already provided for a notation of malocclusion where present or impending and advise its correction. Be is further

Resolved, That these resolutions be given as wide publicity as possible by publication in the several dental journals and the bulletins of state and other dental societies, and organizations engaged in child welfare work.

NEWS AND NOTES

The American Board of Orthodontia

A meeting of the American Board of Orthodontia will be held in Denver following the American Dental Association meeting in July.

Those orthodontists who desire to qualify for a certificate from the Board as outlined in the article entitled, "The American Board of Orthodontia," page 50, January issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY, may receive full information and application form from the secretary of the Board.

DR. ALBERT H. KETCHAM, President,
1232 Republic Building,
Denver, Colorado.
DR. OREN A. OLIVER, Secretary,
1101 Medical Arts Building,
Nashville, Tennessee.

Second International Orthodontic Congress

The Second International Orthodontic Congress will be held in London in 1931 at the Hotel Great Central from July 20 to 24 inclusive.

The officers of the Congress will be as follows:

President-General	J. H. Badcock
Vice-President-General	G. Northcroft
Treasurer-General	E. D. Barrows
Secretaries-General	A. C. Lockett B. M. Stephens

A list of honorary presidents and vice-presidents will be communicated later.

A full and interesting program of papers and demonstrations is anticipated, and a museum is being organized. Suitable entertainment for ladies accompanying members will be arranged. Intending contributors to the activities of the Congress can obtain from the Secretaries of their respective orthodontic (or dental) societies the conditions under which contributions are invited. The Secretary-General (Mr. A. C. Lockett, 75 Grosvenor Street, London, W. 1) will also be glad to give any further information on request.

Information regarding travelling facilities and hotel accommodation may be obtained from the official agents to the Congress, Messrs. Morgan Pope & Co., of 7 St. James's Street, London, S. W. 1; 6 Rue Caumartin, Paris; 71 Vanderbilt Avenue, New York; Messrs. Noel Vester & Co. (agents), 44 Unter den Linden, Berlin.

American Society for the Promotion of Children's Dentistry to Have Luncheon Meeting

The fourth annual business luncheon of the American Society for the Promotion of Children's Dentistry will be held at the Brown Palace Hotel, Denver, Colorado, Thursday, July 24, at 12:15 P.M.

All members of the American Dental Association are cordially invited to attend.

Greater New York December Meeting for Better Dentistry

The sixth Greater New York December Meeting for Better Dentistry will be held at the Hotel Pennsylvania, New York City, December 1-5, 1930.

The committee is preparing a program which will be both interesting and of high scientific value. Among the essayists will be Comm. H. E. Harvey, Norfolk, Va.; Stanley D. Tylman, Chicago, Ill.; Frank Fox, Philadelphia, Pa.; M. S. Weaver, Cleveland, Ohio; W. J. Chartres, Des Moines, Iowa; V. Kazanjian, Boston, Mass.; W. H. Wright, Pittsburgh, Pa.; E. N. Kent, Boston, Mass., and F. Blaine Rhobothom, Chicago, Ill.

The topic discussions will again occupy an important place in the program.

A manufacturers' exhibit will be held in the hotel simultaneously with this meeting.

JOHN T. HANKS, Chairman,
CHARLES M. MCNEELY, Vice-Chairman.

Notes of Interest

Dr. Frank E. Shelden and Dr. Homer M. Shelden announce the removal of their offices to 1624 Professional Building, Kansas City, Mo.

Dr. B. Frank Gray announces that his new address is Suite 2418, 450 Sutter, San Francisco, Calif. Practice limited to orthodontia.

Dr. Charles M. Alderson announces the removal of his office to Suite 606, Brockman Building, 520 West Seventh Street, Los Angeles, Calif. Practice limited to orthodontia.

Dr. Robert E. Allen announces the opening of his office at 335 St. James Building, Jacksonville, Florida. Practice limited to orthodontia.

Dr. Dennis D. Glucksman announces the removal of his office to 230 West 79th Street, New York City. Practice limited to orthodontia.

Dr. W. H. Snoddy wishes to announce the limiting of his practice to children's dentistry and orthodontia. His office is located at 207 Midwest Building, Casper, Wyoming.